EDITORIAL

THIS has been a real Thanksgiving.

HOW would it do just to turn the Kaiser over to his own people?

BE sure to sign the Christmas Roll Call of the American Red Cross.

HAVE you fulfilled your War Saving Stamp pledge? If not, why not?

AUSTRIA-Hungary—well, rather, and cold too, with winter coming on.

WHY shouldn't the official scrap commissioner settle the row over the Macy award?

PRINCE AXEL claims to hail from Denmark. Apparently, he would be more at home in Greece.

HOW quickly the Government's taking control of any public utility is followed by an increase in rates!

PERHAPS it is just as well that we did not confine all of our energies to the construction of wooden ships.

WHAT a splendid doorman the Kaiser would make for some New York hotel. He could wear out all his old uniforms.

THE ex-Emperor of Austro-Hungary is said to have shed tears when he saw the armistice terms. Crocodile or influenza, Karl?

APPARENTLY everything will be all right if the Atlantic, Gulf, and Lake shipyards can attain to the Pacific Coast standard of efficiency.

TURKEY in America at 60 cents a pound is high enough, goodness knows. Turkey in Europe without the Teutonic stuffing is dear at any price.

THE removal of the influenza masks is not an altogether unmixed blessing, judging by the faces we have had a chance to forget during the last few weeks.

ONE year's subscription to 'Metal Trades' is the prize offered to the man who can name correctly the republics now doing business in the late domain of the Central Powers of Europe.

WE are waiting for an announcement to the effect that Bill Hohenzollern has gone into vaudeville. He would make a great hit in a high and lofty tumbling act.

THE ex-Crown Prince was held up at the Dutch border by a common sergeant. That's nothing to what would have happened to him if he had gone up against a head waiter in a Broadway restaurant.

THE 'Diablo', the first ship launched by the Pacific Coast Shipbuilding Company, was originally given the name 'Apistama'. Without giving the matter a great deal of consideration, we would say that this is also a devil of a name.

WAR as a teacher of geography has already been discussed in these columns. The comparative ignorance of many manufacturers and merchants regarding the geography and customs of South America is frequently mentioned, particularly in Government publications. Is it possible that the disturbance in Peru and Chile has been started in order that this ignorance may be corrected?

IF present wage-scales are to be maintained and efficiency of labor is to remain the same, prices must also be maintained. Can this be done for any considerable time after peace is signed, in view of the disinclination already shown by large consumers, particularly the railroads, to buy at the present figures? It looks as if the best bet of the labor leaders was to encourage employees in general to give a full day's work in exchange for a full day's pay.

EMERGENCY activities and control by the various special Government departments, unless Congress takes additional action, will cease as follows: Control of telegraph and telephone lines, food and fuel control, the Espionage Act, the War Trade Board and export control, and the activities of the Alien Property Custodian will all cease with the end of the War. The Alien Property Custodian will have an extension of time for certain duties. The War Finance Corporation, the Capital Issues Committee, the Aircraft Board, and the re-organization of Government bureaus under the Overman law have six months longer. The War Finance Corporation will have additional time for liquidating. Operation of the railroads by the Government must stop 21 months after the end of the War, and operation of the merchant fleet 5 years after. Measures for stimulating the production of agricultural and mineral products and for directing labor employment are limited, directly or indirectly, to the present emergency.

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Red Cross Christmas Roll-Call

What would we have done without the American Red Cross? Two million American soldiers overseas, and nearly two million more in cantonments have been assured of the nearest possible approximation to home care and comfort through this great humanitarian agency of ceaseless service and unselfish devotion. Greater than the slogan of the Marines, 'First to fight', is that of the Red Cross 'First to help'. The national emergency brought about by our entry into the War found the Red Cross ready. It is always ready. Only a short time ago, to our chagrin be it said, the per capita membership among the American people was lower than that of any other civilized nation. The great membership drive last December corrected this, so that today there are one hundred members to every one before the War. These memberships are about to expire; our dues are due. One dollar is the lowest annual membership fee. Think of it, one dollar. This dollar is needed more than ever now. The War is over; our boys are still over there. In addition, there is the reconstruction work to consider. Shall we fail to support the Red Cross after it has overwhelmingly made good? We hope not. Show your appreciation by renewing your membership at once. Get the habit.

Cabinet Officials and H. C. L.

Mr. W. G. McAdoo has resigned his two jobs as Secretary of the Treasury and Director-General of Railroads. Twelve thousand a year seems like a good deal to most of us, but it is not enough to keep the wolf from the door in Washington, provided one is a cabinet officer. Even before the days of war prices, few, if any, cabinet officers were able to live on their salaries, and at present, it must be harder yet. Mr. McAdoo says it can't be done, and, as he has been trying it for more than six years, he ought to know. We are sorry to see him go, but have no doubt he can get a good job without difficulty. His resignation calls attention again to the relatively low salaries paid to Government officials in high positions. For generations it has been the rule for such salaries not only to be far below what a man of ability could obtain in private life, but also, in many cases, to be actually insufficient to live upon in the style that the position demanded. Where a man of ability and with a large private fortune could be found to take the office, no objectionable results followed. More often, however, such an office was given either to a second-rate man, or else to a first-rate man that resigned before his term was over in order to avoid bankruptcy. The result is either inefficiency of administration or injustice to the administrator, usually both at once. During an emergency like the War, it is all right to call upon dollar-a-year or twelve-thousand-a-year men, but, as a general rule, Uncle Sam, like any individual, ought to pay for what he gets. No one expects that men in the higher Government positions should be paid as much as they could make in private life, but they should receive a fair proportion of that amount, and at least as much as they are required, directly or indirectly, to spend.

The Casualty Lists

The total casualties among the American expeditionary forces to the signing of the armistice have been made public. Killed and died of wounds numbered 36,154; died of disease, 14,811; died from other causes, 2204; wounded, 179,625; prisoners, 2163; and missing, 1160. The missing will ultimately be re-classed among the prisoners and the killed but not identified. The total wounded includes all injuries, however slight. Doubtless some men have been included more than once. While the individual families of the killed and crippled, as well as the crippled themselves, will suffer just as much as if the casualty list were ten times as long, the loss to the Nation as a whole has been relatively slight. The number of killed exceeds by only a few hundred our average yearly mortality from industrial accidents. The total of deaths among the expeditionary force is much less than the total deaths among civilians in this country during the last two months from Spanish influenza. Our sacrifices for the defeat of kultur have been mainly material. Our Allies, on the other hand, have lost heavily, both in material resources and in man-power. The British casualties amount to three million, including fully one million deaths, and the Canadians and Australians have suffered as severely in proportion. The French and Italian losses have not been made public, but the French losses have probably been fully as great as the British, and the Italian have also been heavy. Probably the total number of deaths among combatants on both sides is not far from ten million. When the deaths and other sufferings of non-combatants, directly and indirectly traceable to the War, are included, the total represents a sum of misery too great to be even conceived by the human mind. It is for us who survive to ensure that all this suffering shall not have been in vain.

Food-Saving and Bolshevism

It is up to us and to our Allies to feed the starving people of Europe, be they friend or enemy. The idea is at first repugnant, and naturally so. The thought of the crimes of Germany, Austria, and Turkey will be with us for generations. The murders, rape, and arson committed upon the helpless French and Belgian non-combatants cry aloud for punishment. Even so, consider the rapidly changing political complexion of the Central Powers, with the grim spectre of Bolshevism looming in the foreground. Bolshevism is a disease of a disordered mind. Like many other great evils, it is 'Made in Germany'. It is a reaction from tyranny and an empty stomach, principally the latter. Bad as are the resultant cholera, typhus, and other diseases of the

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body that prey upon starving people, Bolshevism is worse. It is malignant, contagious, and spreads its poisoned tentacles even among neighboring peaceful and democratic peoples. Bolshevist outbreaks have occurred even in Switzerland, that democratic island within a sea of 'divine-right' monarchies. The Hun is vanquished; Kultur is no more. There remains a great task yet to be done. Bolshevism must be cured, and the cure may be found in food. We must continue to save for many months, until order has been restored and battlefields have been brought under cultivation. The German merchant marine has practically ceased to exist. The responsibility for the revictualing of the enemy countries will fall principally upon Great Britain and the United States, so let there be no food slackers. There are but two cures for Bolshevism, food and bullets. The civilized way is to fill the stomach, as a first aid to the restoration of mental balance, not forgetting, in the meanwhile, to pull the teeth of the beast that devastated Northern France and made of Belgium a shambles.

What is the Matter With the Wooden Ships?

That something is the matter with our new wooden ships is evident or there would not be talk of converting into barges those now building. Neither would a committee have been appointed to investigate. Along the waterfront one can hear almost any kind of story from muckrake to whitewash brush, but sifting the wheat from the chaff it seems that, at their best, wooden ships are not suitable for transoceanic traffic except in an emergency. The cost is great, the operating expense high, and the carrying capacity is low. No private concern could operate ships of this sort and remain solvent. Furthermore the design, particularly the Hough type, seems to be faulty. Rapid construction is facilitated by the use of the Hough design, but the vessels are so hard to handle and steer that improvements in reconstruction are being made looking toward improvements in this respect.

The greatest fault of the wooden ships seems to be due to the use of green timber and to poor calking. Dozens of ships have had to be recalked after their first voyage, and in some cases it was with great difficulty that the pumps handled the leaks. Two ships have been lost off the coast of Lower California and although it is claimed that heavy weather was the cause, charges have been made that the vessels sank because the pumps could not handle the leaks. It has been the custom to keep the wooden ships in the Island and Coast trade until they were in shape to take the trip to the Atlantic. In justice to them, it must be admitted that they have handled the larger part of the Hawaiian sugar crop, also that many of them have gone into the Atlantic service and are apparently satisfactory. Aside from poor steering qualities and poor calking most of the vessels are well built and are satisfactory in the emergency. However some of the boats built in mushroom yards are poorly constructed. Probably inadequate inspection combined with a desire for rapid construction is the cause. One such ship was so poorly fastened that a competent shipbuilder declared it was not worth repairing.

At best, it is fortunate that our Uncle Samuel did not place his main dependence in wooden ships and that he is able to stand the expense of building and operation, for no one else could.

Industrial Democracy

By Edward J. Fowler

With the coming of peace the industrial enterprises of the Pacific Coast must take stock and formulate plans whereby they may share in the future upbuilding of our district, State, and Nation. The general public in the vicinity of San Francisco particularly are certainly not awake to the importance of the iron and steel industries and their products, with the result that far too little attention is given to fostering the growth of such industries.

We have great shipyards on our shores, which are second to none, fully equipped with the best tools and appliances that money and personal ingenuity can install, turning out ships of any desired type, which have proved their superiority in all parts of the world. We have modern machine-shops, iron and steel foundries, rolling-mills, forges, and various manufacturing plants for the production of numerous articles favorably known all over the United States, including gas-engines, pumps, tractors, castings, special machines, mining and smelting machinery, and other articles too numerous to mention. These activities at the present time probably employ around 70,000 men within the San Francisco district alone. If the old political factor of five to one is used, we find a total of over 300,000 people dependent upon the industry, or approximately one-third of the population. Surely an industry of this proportion should command the co-operation of civic as well as special organizations, to say nothing of the desirability of keeping advantageous payrolls contributing to the welfare of the entire community.

Previous to 1914, this was a great jobbing district, depending upon some new work, but mainly upon repairs and occasional special orders, and, as such contributing only partly to the growth of the State, although even before this time, many concerns were discovering that certain of their products were meritorious and were sought by consumers outside of the State, and their trade began to show marked progress. Now that the War has stimulated trade, and shops have been re-furbished and improved, there is greater promise than ever of securing our share of the world trade. Those who have the growth of industry at heart are hopeful of putting the Bay City district upon the industrial map and graduating from the jobbing to the manufacturing class, whereby the individual, State, and Nation, all may prosper.

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provided they can successfully answer the question, 'What about Labor?'

In the light of present conditions, as well as some past conditions, this question cannot be answered favorably. We have a call for a strike-vote among the unions at this time, which call, whether it develops a strike or not, is distinctly an unfriendly act and a disturbing factor inimical to industrial growth. An agreement exists that contains a definite clause allowing no strike or lockout, so that a call for a strike-vote is in effect a call to discuss whether the agreement shall be broken or not. The agreement further provides for an adjusted wage-scale, dependent upon the changes in the cost of living. It provides for adjustment of disputes and its construction is the result of over ten years' experience.

The reason given for the strike-vote is the refusal of the non-shipyard employers to pay back-wages from August 1 to the present time, because the Macy Award has ordered the shipyards to do this, for which they will be reimbursed by their customer, the United States government. The non-shipyard employers will not be reimbursed and cannot recover such back-wages although they are working for other departments of the Government. The scale indicated by the Macy Award is accepted by the employers because they agreed to accept it as applying to the trades noted in the agreement. Labor, however, has protested this appeal to Washington. Still the labor leaders want the employers to start paying a scale that they say is all wrong anyway, and is subject to change at any time. The back-wage or retroactive wage was not accepted by the employers nor even contemplated by either side at any time. It is not a part of the agreement, so again a strike-vote is called to consider the enforcement of a condition not covered or even intimated by the agreement.

This bickering and quarreling in the face of an agreed system of compensation and work is rapidly becoming so continuous that it is striking at the root of all industry, whether jobbing or otherwise, and brings about a state of mind absolutely against the development of any industry or any form of agreement. The employer cannot give his full attention to necessary business details when he is continually harassed by all sorts of union activities and regulations, and is on the defensive against his own organization instead of developing it for the performance of duties that will improve his product. Labor seems to have an idea that the employer is only a disbursing agent for a pot of money which comes from a chimerical somewhere and which is for distributing by coercive means, overlooking the fact that the employer cannot pay any wages at all unless he can sell his product at a price to include that wage. Again, there does not seem to be a rate with which labor is satisfied. If the employer paid $20 per day he would get less than $5 worth of work, and there would be immediate activities started to make the rate $25. No better proof of this exists than the Macy Awards, which have been made twice after mature and painstaking deliberation. In each case, when the award was made, it was declared inadequate, and immediate steps were taken by labor to have it increased. The result was that conditions were disturbed and production curtailed for weeks or months after each award was supposed to settle the controversy.

Democracy in its ideal form is predicated upon co-operation, and industrial democracy cannot be a fact until there is co-operation between all departments of industry. The business which has no co-operation in its organization will fail, and the same is true of an industry. There is no autocracy so dominating and so destructive to industry as the labor union as it is operated at present in this district. Its rulings and regulations are far from democratic, including as they do such provisions as: No workmen allowed in shops who do not belong to the union, limitation of apprentices, limitation of output, the minimum wage to any workman whether good or bad, the silent strike, and many other autocratic regulations. The spirit of the times is more money and less work and all economic principles are thrown overboard. The district is favored with many good workmen who use their talents to the best advantage, but they are in the minority, and must in very fact sacrifice their ability to some ordinary and inefficient workman, who cannot produce, but who must be hired to fill in the force at a minimum wage. This minimum by its very existence cuts down the compensation of the good workman so that the shop average will not be higher than the employers' market can absorb.

With these facts in mind it seems strange that labor leaders cannot see that their greatest strength is in a knowledge as to what an industry can stand in the form of wage-rates; that they do not welcome any information along the line of learning the needs of the employer, and meet the employer for once (just once) without making a demand for more, confer with him and find out the many troubles aside from labor, understand his problems and help him to produce at a price that will enable him to pay good wages.

The outcome of these problems and the securing of industrial democracy can be brought about by two plans only. If the employer desires to continue the peaceful pursuit of his chosen vocation and if he cannot get the co-operation of organized labor he must in self-defence resort to unorganized labor, cost what it will, because it is impossible to conceive of more disturbed shop conditions than have prevailed in the past year, or else the employer and organized labor must get together and formulate a continuous working plan whereby the workman will not be against the employer. In any event the iron and steel industries must go ahead and plans must be formulated quickly for such progress. This great State cannot allow its most productive industry to slow up. Competition with other centres must be met, and to accomplish this we must have co-operation instead of obstruction; the abolition of hide-bound customs and antiquated methods and rulings so that every man, including even the employer, may enjoy the highest living standards and build up an industry that will be a credit to the State and profitable to all its operatives.

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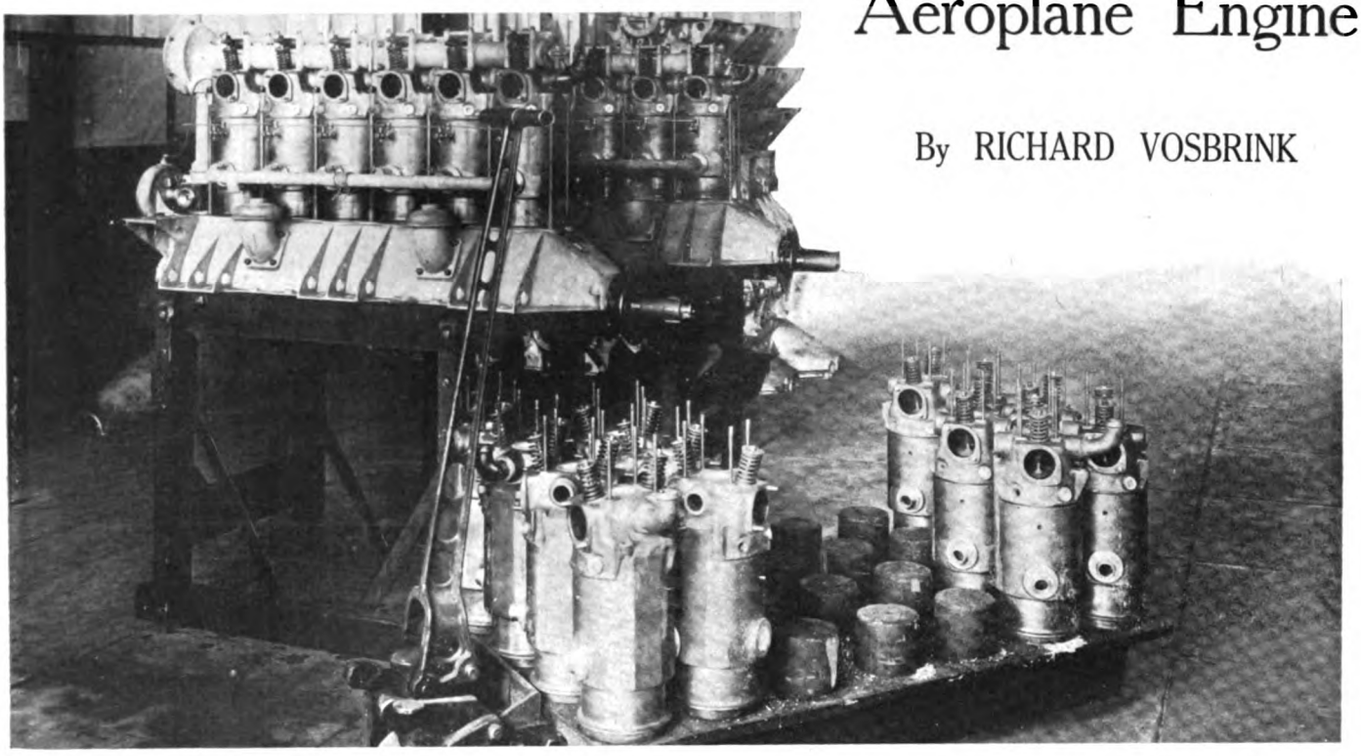
Manufacture of Cylinders for the Hall-Scott Aeroplane Engine

By RICHARD VOSBRINK



COMPLETED CYLINDERS READY FOR ASSEMBLING

'WINNING THE WAR' was materially furthered by the work of a Californian company in furnishing aeroplane-engines to the Government. Some of the operations followed to produce the accurate results required are described in this article by the chief engineer of the Hall-Scott Motor Car Company.

MORE than 3000 aeroplane engines of one type ('Liberty 12') were built and accepted by the Federal government during the month of October. To those unacquainted with the subject this may not seem remarkable, because of the general publicity given to quantity production, especially in the automobile industry. In some instances it is widely advertised that some companies produce thousands of complete motor vehicles every day. Comparisons of this character are illogical and are not to be accepted as criteria in considering the subject. The factors involved are entirely dissimilar.

It is interesting as well as pleasing to note that a great deal of the credit for the present development of the Government aircraft program belongs to a local industry. The Hall-Scott Motor Car Co. has been a pioneer in the design and development of aeroplane engines, having successfully manufactured various types of these engines for a period covering ten years, and in pre-war days was the largest producer of this type of engine in the United States.

A high-grade engine is a somewhat complicated mechanism, made up of many parts, some comparatively simple to make, while the manufacture of other parts requires the solution of complex problems. This article deals with the manufacture of cylinders, as their production necessitated overcoming numerous difficulties before a successful manufacturing design was accomplished. Engines for aviation purposes are required to deliver power in excess of that considered possible by most manufacturers. At the same time the engine must conform to definite limits and requirements as to size, weight, fuel and oil economy, etc. The entire subject is co-related and affects all the characteristics of the engine, such as volumetric and thermal efficiencies, compressive and mean effective pressures, inertia forces of reciprocating parts, and lubrication. The weight question alone compels the adoption of safety factors that are low as compared with ordinary commercial engines. After experimenting with different types, a critical analysis of cylinders led the Hall-Scott company to decide that cast-iron cylinders with water-jackets cast integral, if they could be made successfully, were the only alternative to all-steel cylinders. Steel cylinders, until quite recently, were not commercially practicable on ac-

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ABOVE—PLACING CORES IN MOLD. LEFT CENTRE—CORES FOR WATER-JACKETS. RIGHT CENTRE—BUMPER AFTER LIFTING PATTERN. BELOW—PUTTING GRAPHITE ON CORES

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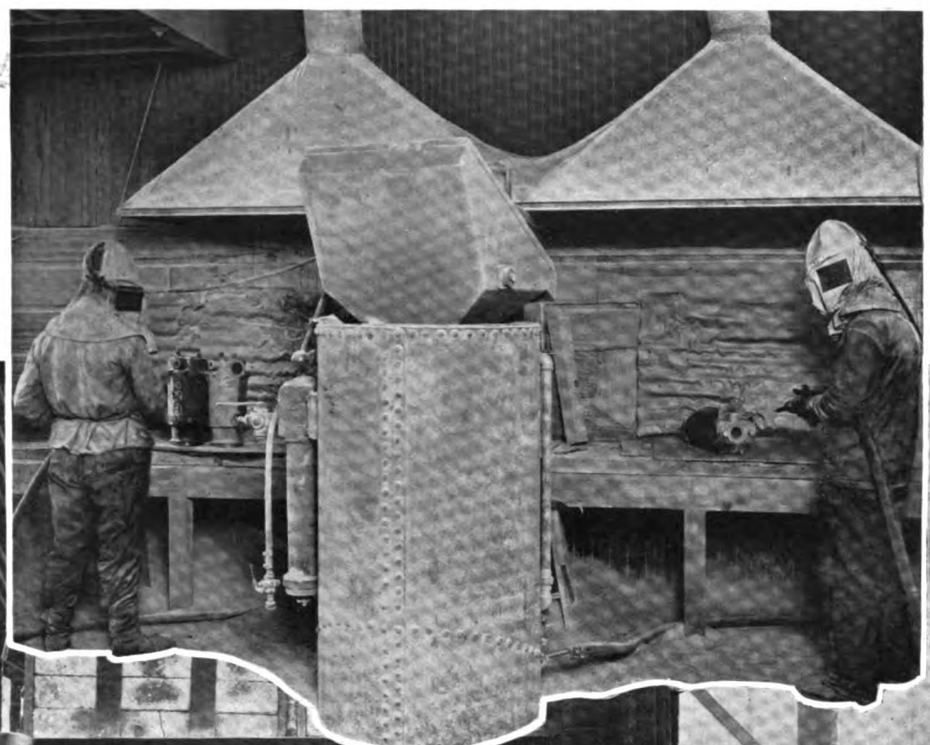
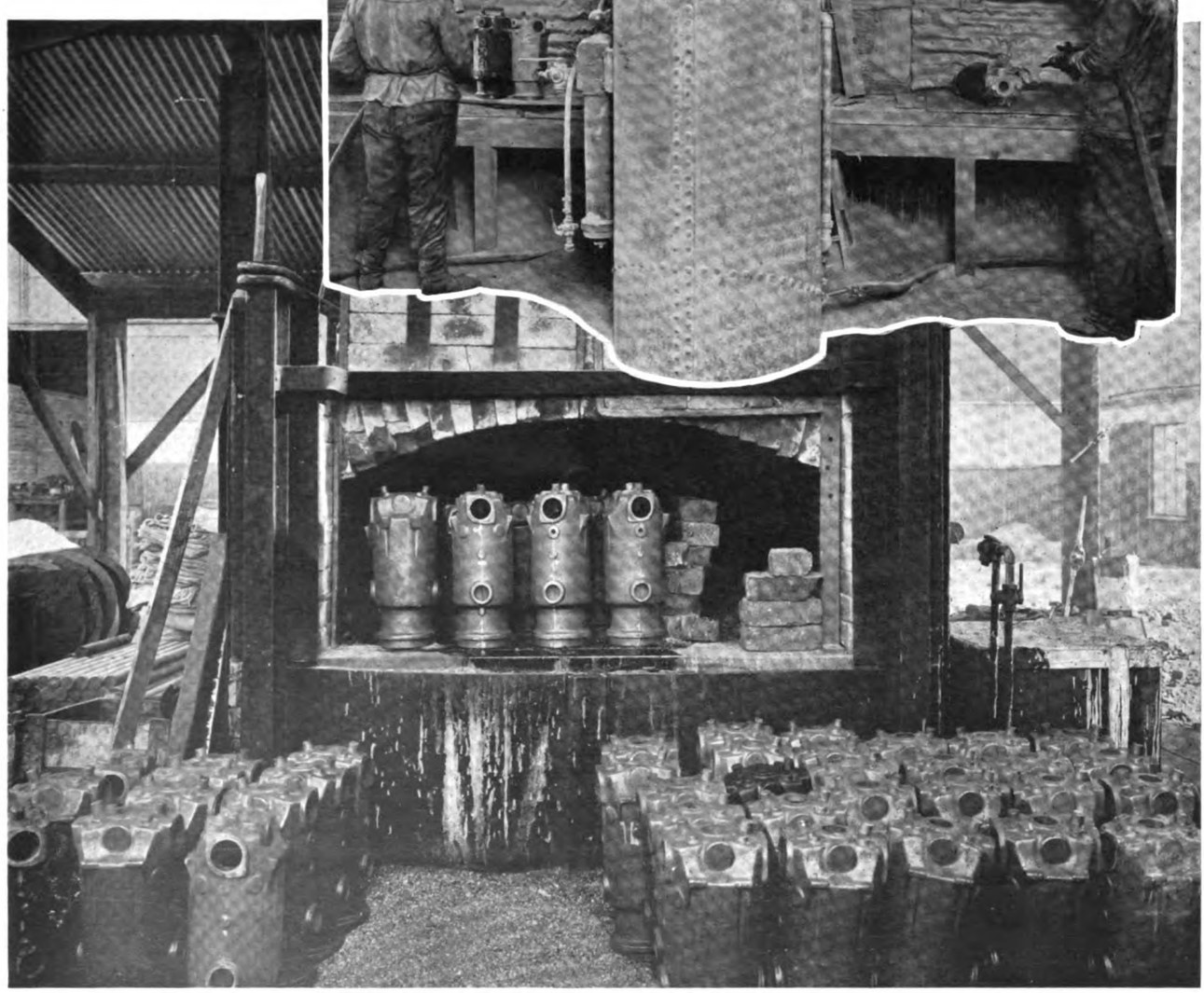
count of limited production. In the Hall-Scott cylinder as finally designed the average thickness of metal does not exceed $\frac{1}{8}$ in. The weight is about 25 lb., yet the power-delivering capacity is 30 hp. per cylinder.

A drawing on paper looks simple. Presumably all there is to do is to make a pattern and have the foundry proceed to cast from it. But when you go to the foundryman and tell him that you want a cylinder made with a thin metal section, he will perhaps look dubious. Probably he will say that he will take a chance. Then you tell him that the iron must conform to a certain chemical analysis. There must be just so much silicon, so much manganese, so much carbon, so much phosphorus, and so much sulphur. He looks at his pile of miscellaneous scrap, scratches his head, and wonders. You also request test bars to determine the physical properties. These must be subjected to shear, impact, and other tests to conform to certain requirements of strength. When you have given him time to assimilate this information and he has decided still to take a chance, you request about 100 perfect castings a day, not just good ones, but castings without a single flaw. There can be no sand-pits larger than a pin-head; no porosity, no 'cold-shots', or 'mis-runs'. By this time he will begin to have visions of augmenting his pile of scrap. When he realizes the equipment necessary to make this number of cylinders a day, he wants to know how much production you will have that will





ABOVE—CLEANING CYLINDER-CASTINGS WITH SAND-BLAST. BELOW—CYLINDERS IN ANNEALING-OVEN

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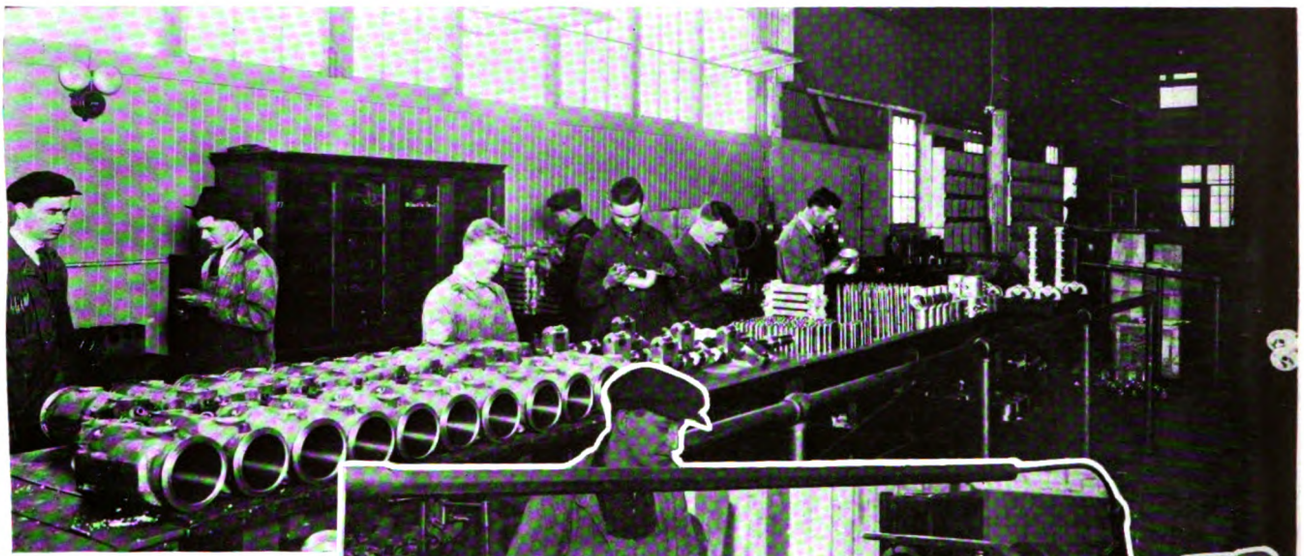
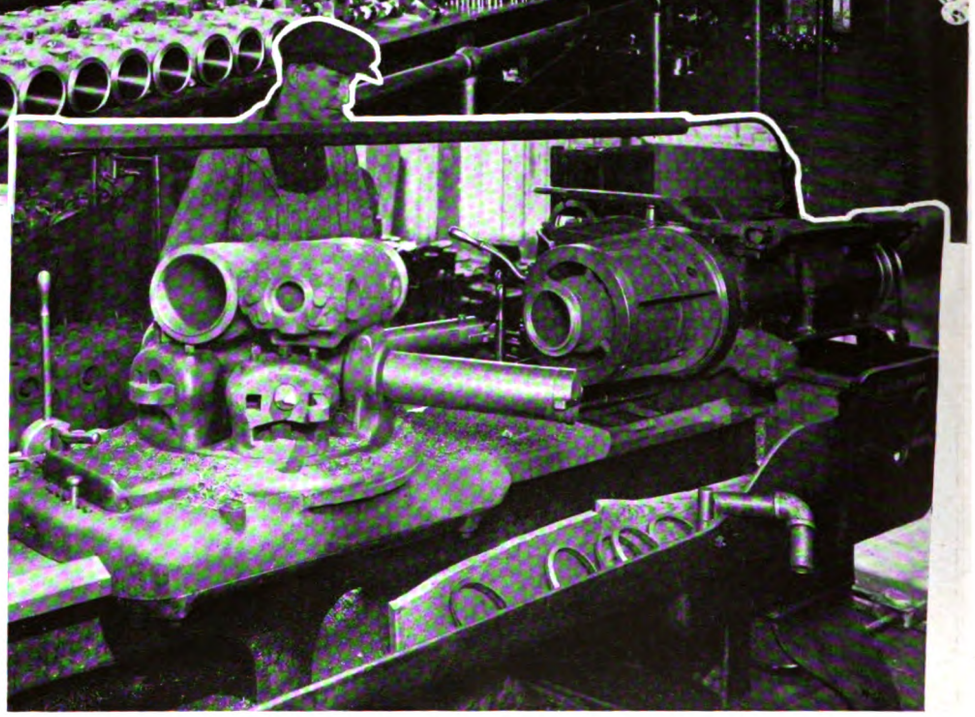


INSPECTION OF CYLINDERS



MACHINING CYLINDERS IN TURRET-LATHE

justify him building this equipment. When you can give him no definite assurance as to how many you will want, he is not likely to want to take a job of this character. This is especially true of Western foundries, as they are not accustomed to this class of work. It speaks well for the progressive spirit of the directors of the H. C. Macaulay Foundry Co. that they undertook to cast the Hall-Scott aeroplane engine cylinders.

The production of these cylinders in the quantity required necessitated the expenditure of thousands of dollars and continual experimenting before success was attained. Hundreds of special flasks had to be made. A special oven was built to bake the molds. Scores of expensive iron dryers were built to bake the cores. The cores themselves had to be measured with snap-gauges within 1/64 in. Special core-ovens were required. A machine had to be built for jarring-down and molding. All kinds of experiments with gates and risers had to be made, different positions of the mold for pouring, on end, lying flat, etc. In spite of all the detailed supervision and attention given to this work, many a morning saw a beautiful pile of scrap rolled out of the sand. The photographs illustrate some of the foundry processes, but they can give only a faint idea of the results accomplished by Mr. Macaulay and Mr. Henderson. Up to the present time they have cast more than 10,000 cylinders. It was only through their untiring efforts and attention that this result has been accomplished.

The raw casting being finished, the rest of the work is done by the Hall-Scott company. The cylinders are made from a grade of iron that is locally called 'semi-steel'. This is a misnomer. Nevertheless, the material is not like the ordinary close gray-iron product. The castings cannot be machined successfully as they come from the foundry, since the metal is hard, brittle, and glassy. Before the castings can be used, it becomes necessary to anneal them to a uniform hardness of about 30 points on the scleroscope. For this purpose three special ovens were constructed like the one shown on page 476. After the cylinders are put in the ovens the fire is started, and the ovens are brought to a temperature approximately 1500° F. as registered by the pyrometer. This process requires about five hours. The ovens are then allowed to cool to a temperature of about 200° F., after which the cylinders are taken out. The cooling is generally allowed to take place over night, so that no time will be lost in waiting. After they are annealed, the cylinders are sent to a cleaning department where the rough spots are ground off, core-wires removed, etc., before they are sent to the machine-shop. The first machining operation consists of boring out the main barrel, turning the flanges, and

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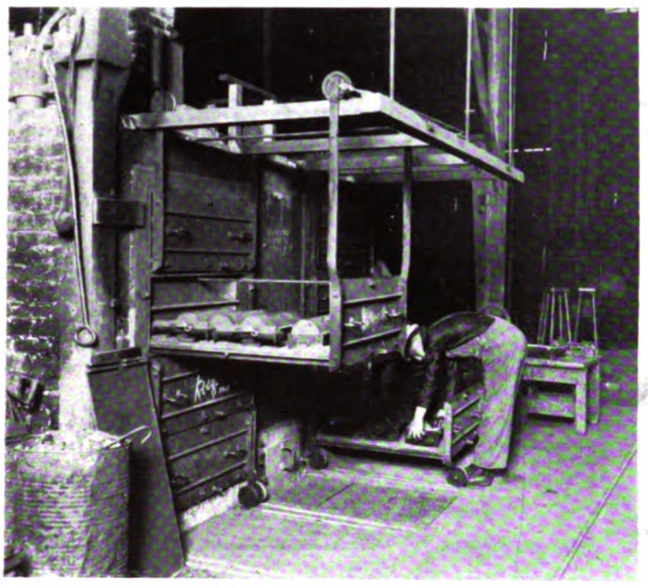
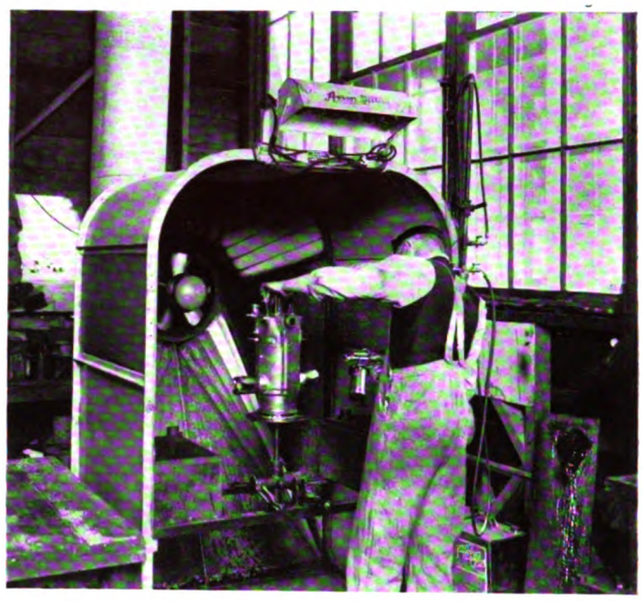
facing the tops. This work is done on two Libby turret-lathes, equipped especially for the job, with boring-bars, cutters, and chucks. For each of the various machines used in manufacturing these cylinders, special fixtures, jigs, and holding-devices had to be designed so that the work could be performed in minimum time.

Before the cylinders leave the turret-lathe they are inspected, and perhaps a few of them will fall by the wayside. After being bored, the cylinders are sent to the sand-blast department and every bit of dirt and sand adhering to them is removed. They are next sent to the polishing department where they are buffed and ground all over. They are then returned to the machine-shop for further work. The top core-hole is tapped in one machine. The cylinder is then sent to the milling machine and the sides and flange-faces are milled accurately to size. They are then sent back to the various boring mills and drill-presses for further drilling and tapping. Every machine does some particular operation, and many of the fixtures and jigs are elaborate and expensive. The work is inspected after each operation.



PLACING CORES IN OVEN



ENAMELING COMPLETED CYLINDER

The cylinders, after passing through various operations, are now finished sufficiently for water-testing. The jacket-walls are only 3/32 in. thick, but if these or any porous spots in the metal fail to hold water under 80 lb. pressure there are more rejections. If the cylinders successfully run the gauntlet of the water-test they are again returned to the machine shop where the bore is ground accurately to a glass finish on Heald grinders. They are now sent to the inspection department where a formidable array of precision gauges awaits them.

The cylinder is now sent to the assembling department, where the cylinder core-holes are plugged, all water connections and studs put in, and the valves ground and assembled. Then more inspection. The cylinders are now ready for enameling. This process in itself required considerable thought and development before it was perfected. When first received in the enameling department the cylinders are oily and coated with grease. In this condition they cannot be enameled. To prepare them for enameling it is necessary to heat them to approximately 250°F. for about two hours. This expels all the oil from the pores in the iron so that it can be thoroughly cleaned. When the cylinder is cold it receives one coat of enamel from a special spraying machine. This first coat is baked for three hours at 250°F. When cold the cylinder is again sprayed with the finishing coat and the baking process repeated. The oven for baking and the carriage for holding the cylinders were built especially for the work. The temperature of the oven is regulated thermostatically with an automatic electric device. The cylinders are now finished, and routed to stock—finished products.

They are, however, subjected to further vicissitudes before they leave the factory. Cylinders are requisitioned from stock and assembled on the engines, and the engines, before acceptance and delivery, are subject to a gruelling 'running in', consisting of a preliminary test, an endurance test, and an acceptance test. If during this testing process, the slightest defect develops, the cylinders are again subject to rejection.

Even with accurate cost accounting, time studies, machine loading, carefully determined feeds and speeds, and high-class equipment, the manufacture of one cylinder is an expensive proposition, so, when one is rejected in the final test, it means a substantial loss. This article has described the manufacture of one part of the engine, and indicates that the building of a complete aeroplane engine is no small task. Considering that there are hundreds of parts, that each one is different, and that they are of many different kinds of material and varied composition, each one requiring entirely dissimilar handling, running and treatment, it can readily be understood why an aeroplane engine costs a considerable sum of money,

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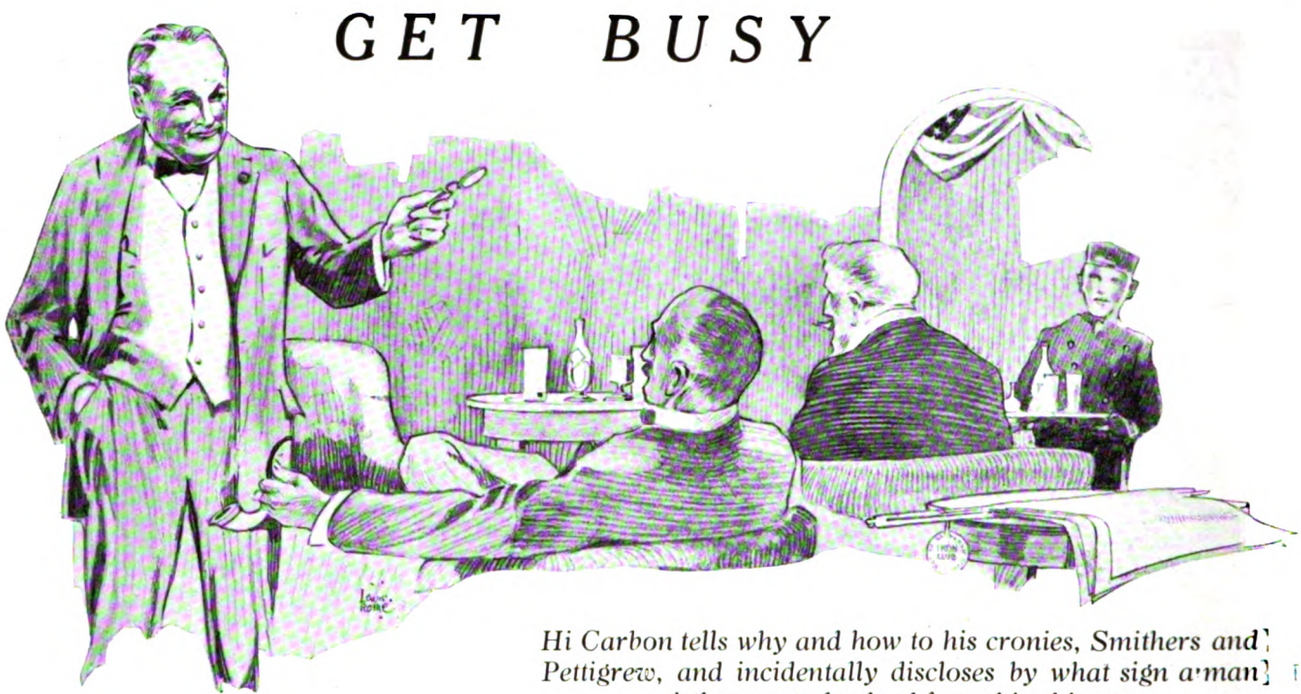
GET BUSY



Hi Carbon tells why and how to his cronies, Smithers and Pettigrew, and incidentally discloses by what sign a man is known to be dead from his chin up

"I seem to feel somehow, as if I had just recovered from a dangerous illness," remarked Smithers as he dropped wearily into his chair at the Iron Club one afternoon late in November. Outside the fall rain was pattering merrily against the broad window panes. The street lamps were lighted, and cast a flickering light on the shining asphalt of Market street. Scores of pedestrians were scurrying about, gripping umbrellas, bundles, and invading the islands of safety in the midst of a stormy sea of automobiles.

"We all seem to feel about the same way," said Pettigrew, who had been watching the bustling crowd in a pre-occupied way. "Even talkative old Hi wears a serious look. I guess he isn't sorry he hasn't a fine set of problems to face such as confront our fellows in the metal trades."

"It is going to be some problem," replied Smithers. "Much will depend upon the course taken by the various Government War organizations. It should not be forgotten that it took about a year before we made any kind of a showing at the Front. Now the problem is to unscramble the eggs, to return to peaceful industrial development with a minimum of upset."

"One thing is a cinch, and that is that it can't be done all at once," said Pettigrew. "With two million soldiers in France, to say nothing of the enormous quantity of stores, supplies, and equipment, it looks like about two years anyway before all of our boys will have returned to civil life."

Hi Carbon had been filling the somewhat unusual role of listener during the course of this conversation, although he seemed to be struggling at times to find a favorable opportunity to take part.

"It is a curious thing how many predictions as to the outcome of the great struggle have gone glimmering," said Hi, musingly. "Excess prophets, I call them. The Hun has been the bogie man, and he was a real one when things seemed to be coming his way. All these whines from Dr. Solf and the German women make me tired. We don't have to guess what kind of a peace it would have been had the Ex-Kaiser been able to put it over. However, we will have to do the right thing. The hungry must be fed, be they friend or enemy. Order must be restored in Central Europe. We mustn't forget that there is one thing that is even worse than Kultur, and that is Bolshevism. The Germans sowed the seed in Russia, and now they are harvesting the crop of anarchy in their own country. However, consider for a moment the return to business as usual." Hi paused for a moment, trying to revive a cold cigar. It wouldn't work, so he gave it up.

"Only a few weeks ago, the draft boards issued a list of useless occupations as an extension of the 'work or fight' order. Among them were salesmen and advertising agencies. As the jokesmith said of Mary's little lamb after a day in Pittsburgh, 'Now look at the darn thing.' The salesman and the advertising man are being carefully removed from their atmosphere of moth-balls, washed, dusted, fed, and re-furnished in fine shape. They receive a friendly 'Good morning' from the Boss now, when only a few days ago, the icy stare was the portion of those who still held their places on the payroll."

"The reason?" continued Hi, "why, of course, Uncle Sammy is busting munition and war-supply contracts as fast as his buster will work. Millions and millions of dollars worth of orders for iron and steel products have, within a few days, been reduced to scraps of paper. The War Industries Board is looking kindly now upon building construction, good roads, bridges, and all sorts of things that have been given the go-by for eighteen

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months. And remember, that while I am not one of those 'excess prophets', nevertheless, you probably have not forgotten that I said some time ago, that we, industrially, are just about as poorly prepared for Peace as we were for War."

"Do you think we are in for a siege of hard times, Hi?" asked Smithers, anxiously.

"On the contrary," replied Hi, "we are in for many years of the greatest business and industrial expansion this country has ever known. There isn't any question of it. Stop and think a minute. For eighteen months there has been nothing but War work in the United States. Every ounce of energy and every pound of material was expended for one purpose, and one purpose only, and that was winning of the War. Now that job is done. Outside of police work and the preservation of order in the enemy countries, the finish will be found at the peace table, when the bill that Germany and the rest of that unholy alliance will have to pay will be presented and O. K'd. That part of the job can safely be left to the diplomats. Our end of the job is to take off our coats and see if the old trade we used to have can be revived and increased in proportion to our excess manufacturing capacity."

"When I said there was going to be a great industrial and business expansion, I meant every word of it," continued Hi. "The question that agitates me more than anything else is whether the metal trades industry of the West is going to crawl back into the old dugout of restful sleeping, as before the War, or whether they are going to show as much capacity in getting orders as they have shown in filling them."

"You seem to think that our fellows are a lot of dubs, Hi," remarked Pettigrew somewhat resentfully.

"No, you are off on the wrong foot there," replied Hi. "They are anything but dubs. They are the livest bunch in the country today, and they have proved it during the shipbuilding emergency. But, it cannot be denied that they are away behind other sections of the country in their understanding of selling. The big fellows in the East have had their lines out for trade expansion ever since we got into the War. They have men out studying the South American and other foreign markets, compiling statistics and all sorts of dope on the requirements of our little brothers on the other side of the isthmus. Some of the big banking interests are already establishing branches in foreign countries in order that the very necessary credit information may be forthcoming when it is needed. In other words, the machinery for trade expansion is already on the erecting floor, the only question is, whose machinery."

Hi paused to catch his breath. "I don't suppose any of you fellows ever look at such things as consular reports, and other matter distributed by the Government," he continued. "If you did, you would know that for some years Germany has practically monopolized foreign trade, especially in South America. Our foreign trade with Europe was represented by raw materials principally. They took our oil, cotton, copper, and many other things, made things out of them, and then, by ginger, sold them back to us again, and to our neighbors. Just when we may expect German competition again will depend on their internal political rejuvenation. France and England have Government commissions on the rehabilitation of business. We haven't built anything like as much ship tonnage as most people think. British mercantile marine is being withdrawn from troop and munition transport in order to return to commercial business. I hope that the program of the Emergency Fleet Corporation may be at least partly completed, in order that we may not again be high and dry as soon as we get away from our own shore."

"You talk as if there wasn't going to be anything but foreign trade, Hi," said Smithers; "isn't there going to be any domestic demand for our machinery?"

"Of course there is, and the biggest kind of demand," answered Hi. "Didn't I say a few minutes ago that for one solid year and a half, every single bit of development work had stopped? Just as soon as people get settled down into their stride again, you will see things start with a rush. There are hundreds of new industries, dye-stuffs as an example, that couldn't be made in the United States. The demand for metals by Europe to replace exhausted stocks will make the miner hustle. That means more and more mining machinery and supplies. Building construction will at once revive. Think of the demand for plumbers' supplies, with available stocks almost exhausted. Take the power situation. We are going to need more and more hydro-electric power for our newly made chemical industries, for transportation, too, in order to conserve our limited supply of oil. It won't be long before it will be almost a crime to burn oil under a boiler. It is too wasteful. The internal-combustion engine with its 35% efficiency as compared to about 20% for the best steam-plant will come into its own in the West, where coal is scarce. The lignite deposits will be opened up as a means of supplying producer gas for power purposes."

"Have you gone into a trance, Smithers?" said Hi, who noticed a rapt expression on the face of one of his audience.

"Oh, no, Hi," replied Smithers, brought to with a start, "I was just buying a new car with my dividends from all your prosperity."

"Go ahead and laugh, you big stiff," retorted Hi. "If you don't get a move on yourself, your friends east of the Mississippi will grab the dividends, and you will be hoping for an order for six manholes at three cents a pound, the way you used to do. Where are you going to get orders for those nice new jar-downs of yours? How about those fancy vertical turret-lathes, your new gear cutters, and the stylish high-speed radial over in the corner that you were bragging about the other day? I don't believe you have done one blessed thing about overhauling your standard line of stuff and bringing it up to date. Where are your plans for your sales campaign? Where is the dummy for your new catalogue? Where is your list of dealers who might be glad to handle

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your stuff? Shucks, you have the liveliest feet on the golf links I ever saw. But your head, oh my!"

"That settles your hash, Smithers," laughed Pettigrew; "the old man is going fine this afternoon."

"Pardon, reverend Hi," said Smithers, who by that time was laughing, too; "but, seriously, I know, of course, that the clock isn't going to stop, or anything like that. What I want to know is, how soon we ought to begin to get ourselves in shape to go after a decent share of the business?"

"One year ago, my friend," returned Hi, "and, failing that, as quickly as you possibly can. Dig up your old salesmen. I suppose they have been working out in your chipping-yard during the last eighteen months, those of them who didn't go into the Army or Navy. Then get after that chief engineer of yours and start something. Better size up your equipment, see what it is adapted for, and then study the market for whatever that may be. Send your salesmen out to get the ideas of the dealers around the interior of the country. They can give you first-hand information as to the needs of consumers in their neighborhood. Don't forget that there is a lot of hard preliminary work to be done. If it is done carefully and intelligently, you will be well repaid. There is no sense in going it blind. You can afford not to get any orders to speak of for a few months. The information you will get will result in real orders and good business later, when you get your foundation well and firmly established."

"There was an advertising solicitor in to see me the other day from some trade paper, and I told him I was too busy to talk to him. What do you think he had the nerve to say, Hi," said Smithers. "He said that the first thing I knew I would be too dead to talk to anybody."

"Ha, ha," laughed Pettigrew. "What did you say to that, Smithers?"

"I fired an inkstand at him, confound his nerve," replied Smithers.

"Nevertheless, the solicitor, although perhaps a mite fresh, was right," remarked Hi. "Advertising is the greatest money saver in the world. It brings your goods in touch with the buyer, the buyer in touch with you, and if you make good, there is the sale. For a few cents each, you can tell your story to thousands at regular intervals. You couldn't have your salesmen reach a fraction of such an audience except at a cost that would be prohibitive. Advertising is a science, rightly directed, that is the greatest single selling agency in the world."

"It always struck me as a cross between blue sky and hot air," said Pettigrew. "I ran an ad in a paper once and didn't get a single order, and only two inquiries for catalogues. It made me so tired that I didn't even answer the letters."

"Before I go," said Hi, rising and starting toward the hat-room, "I am going to disagree with that advertising solicitor you mentioned about a minute ago. You don't have to wait before you are so dead you can't talk to anybody. You are there now, and the worst part of it all is, you don't know it. Good-night, you fellows. I will explain when I see you again."

The Foundrywoman

The following is taken from the 1918 catalogue of the Lennox Foundry Company, Ltd., London, England.

Foundry work has been carried on in the buildings, which Mr. Lennox now occupies, for over 100 years. There are 2½ acres under roof, and about 200 people, including 50 women, are now employed. The work of the women, who have all been trained at the works, gives complete satisfaction: excepting in the pouring department, in which men alone are employed, they work in all departments, in the laboratories, molding-pits, and machine shops, as well as in the office, but are under the special control of a lady on the staff, who also looks after their little privileges as to tea and rest intervals, their starting work 10 minutes after the men, and leaving before them, etc. When husband and wife are both in the works, they are not attached to the same department.

Iron in Celebes

Large quantities of iron ore have recently been discovered in the island of Celebes. It is estimated that at least 1,000,000,000 tons are available. The ore is unusual in that it contains about 25% nickel and some chrome. Mining the ore would be a 'steam-shovel' proposition, since it is close to the surface in beds about 50 ft. thick. The country is nearly level, and the Malili river, which is navigable, flows through it. Electric power could be developed nearby.

MODIFICATIONS of the Shipping Board's program as recently made indicate that the Government is developing shipbuilding more and more with an eye to after-war requirements. The wooden-ship yards pass into the discard, so far as Government purposes are concerned, at the end of 1919. Construction of ships less than 5000 tons, admittedly too small to constitute economic carrying units for trans-oceanic trade, is to stop. A $60,000,000 contract for transports, deliveries running into 1920, has been cancelled, and simultaneously reports appear that plans are being considered for building five large passenger liners. A limit is put upon the extension of shipbuilding facilities, the present plant being sufficient for the national need, while inefficient yards are being weeded out.

"MY typewriter ought to have a new back spacer."

"Why, John, don't talk about the poor girl that way."

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Methods of Meeting the Labor Shortage

By H. KERR THOMAS

THIS address was delivered recently before the foremen of the Pierce-Arrow Motor Car Co. Mr. Thomas is assistant general manager for the company. While the armistice has changed conditions to a certain extent, the shortage of labor will continue for several years, at least, while the need for increased efficiency is not going to stop at all.

IN the first place, this poor labor-situation has come as a direct result of the War. It isn't possible to get as many men as we want, or to have those men that we do get, the same quality as we are accustomed to, and by all traditions we have a right to expect; but there is one thing which I want to impress upon you—that the situation is not going to improve. Now you will say the War is responsible for it. The War might last six months; I think it is much more likely to last several years, but whether it ends in July 1919, or in ten years time, I want you to understand this—that the old conditions have gone for good, and they will never come back; and the reason for that is an economic one. At the end of the War, no matter when, the entire industrial world will be bankrupt, and the only way it can reinstate itself is by doing a great deal more than it ever did before.

There isn't one nation in the War that will be an exception—no civilized nation, if it is to continue as a useful society of people. The after-war conditions will be worse, because not only of the necessity of everybody doing a great deal, but because of each nation trying to outdo all other nations in order to maintain what trade it can, and to secure for itself a sufficient amount of trade to pay its debts. Already the nations that have been in the War from the start, have arrived at a state of efficiency that is positively terrifying. In England and France, and I haven't the slightest doubt, in Germany and Austria, everybody is producing many times more than they ever thought was possible, and they will not stop.

In England and in France, with which I am most familiar, the speed and accuracy with which they are working is astounding. I will give you an example. I have recently been seeing a good deal of the executive heads of the Rolls-Royce Co. As you know, before the War they manufactured a high-grade car in small numbers. It was a large and expensive car, and was sold in a limited market. When the War came that particular company, in common with many others, in fact, every other concern in England, was faced with the necessity of cutting off its production on twenty-four hours' notice and coming to a dead stop by order of the Government. In other words, the Government determined they weren't to build any more expensive cars, but they were to build something that was needed. The immediate necessity at that time was, and still is, the aircraft engine. I asked them the other day how they obtained labor. "Oh, we are doing fine now," they said.

At the beginning of the War they employed three thousand men. Within the first few weeks of the War, in 1914, two thousand had gone into the army, leaving one thousand men, men who were over age, and who were technically valuable, too valuable to go into the army. Today they have about eight thousand people working for them, building only one thing, the Rolls-Royce aircraft engine, which is in the front rank of aircraft engines. They are not easy engines to build, because no aircraft engines are. The Rolls-Royce Co. is building them with one-third of its employees women, another third partly disabled soldiers, and the remaining third old gentlemen, retired merchants, bankers, lawyers, and people that couldn't do anything in the War, whom the Government put to work on machine-tools. It doesn't sound attractive, but they are turning out engines of the highest quality, and are producing them at a rapid rate.

A few of the original employees, who didn't go into the War, the technical staff, enginers, and the workmen that were allowed to remain, have been made into foremen, setters-up, charge-hands, and that kind of thing.

This is only one example of what is being done all over Europe from the frontier of Russia to the frontier of Spain. Nothing is being done the old way. This has become necessary, of course, because of the War, but the entire habits of everybody have been turned upside down and they have had to assume an entirely new point of view. Old methods, the methods that you and I and all of us practised before the War, are as dead as the dodo and are never coming back. The ordinary man, and the ordinary habits of mind, aren't of any use at the speed one has to adopt now. The economic conditions that will

The nations that have been in the War from the start have arrived at a state of efficiency that is positively terrifying. In England and France, everybody is producing many times more than they ever thought was possible, and they will not stop.

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arise from the War will require speed. The old methods will be even worse out of date than they are now, because every month people all over the world are getting more advanced in the art of producing high-grade articles with poor labor.

In the first place, if you have a highly skilled worker working for you, you hire him, you give him a job to do, he says he can do it, he goes ahead and does it. If you do not have the highly skilled man, you have first of all to tell him to do the thing, then stand over him and watch him to see that he does it, both of which things you never had to do before, or else only to a limited extent. Then, owing to the lack of experience on the part of the workers, they will with the best intentions bring to you all day long problems which the earlier type of worker never brought, because he unconsciously solved them himself. You must make hasty decisions on these questions. You cannot say, I will go and see, I will ask so and so, I will see tomorrow, or the like. You have got to decide right there; we must do this or we must do that. The next thing that you have to develop, which we all have to develop, is a greater resourcefulness, because the poorer help necessarily makes more mistakes, and one has got to be all the time devising means for preventing mistakes if possible, and for rectifying them where they have happened.

Those three things—closer supervision, more rapid decision, and greater resourcefulness—combined, naturally make everyone of us able to take more responsibilities than we did before. The determination to make good with inefficient help is the quickest way to improve the quality of the help, because all of the time they are growing into something which is much better.

At the present time you are all rather like a man who has lost his leg. There is not the slightest use in telling him he can grow another one, because he can't, but we will give him an artificial leg and with a little trouble, he will be able to work it, and after a little while, he will find he will be able to walk as well as he could before.

Now, the first thing to do is to get people here. It is no use to say we are going to get good people, because we are not, because all the good people are employed. You do not need me to remind you that the actual output of the country has been trebled. The working people have not been trebled. In addition to that, the Army has already absorbed something like two million men, and will absorb many more. Old employees are leaving all the time, and their place is taken by men who are not efficient, but all that we can do is to develop such an efficiency in our own branch that we can make up for what the rest lack.

The first thing we are going to establish is a training school—I call it that for want of any better word—a department where the new help can be taught, because it has got to be taught. One cannot put absolutely green people, not accustomed to thinking in terms of machinery, or even of hardware, before something to be done and tell them to do it. Before being suddenly faced with a machine that is making all kinds of unpleasant noises, slipping things about, and splashing around, they have to be taught that if they keep their fingers away the machine will not hurt them. They have to be taught that the machine will set the pace and they have to learn to follow it in such a way that it isn't kept waiting.

I want each one of you to think over this; in the first place, to realize that you are going to have worse and worse help right along. Secondly, we are going to ask you to deliver more and more and more stuff, until the War ends and after. Thirdly, how you can fit those two possibilities into one another and make them dovetail so they will be going along smoothly. What they can do in France and England, I am certain that we can do in America. The only thing is, we have got to think in entirely new channels, and to remember the people we have to work with must be taught and helped and encouraged.

This is not an easy thing to do, and it takes a lot of patience. I want each of you to look at every man in your department and see if you can do without that man. I do not want you to fire the man, that is another story, but I want you to pick out the best man in your department, and decide what would happen if that man died tomorrow. You cannot go out and get an equally good man to replace him, yet you have got to keep on grinding out the particular thing on which he is engaged. Go on right down the line, and decide what is necessary to train the men that do each operation. When you have thought that out, we will try and arrange the best method of teaching the help. I am not going to disguise the fact that the most of the help we are going to get are women. There aren't any more men. The few men remaining are required in the Army, and those who are not will be required to grow corn and wheat. There are some jobs that are too heavy for women. We will have to try and get men. For example, it takes years to train a toolmaker. We must try to get tool-makers, and what we can't get, we must learn to do without.

We shall establish an Instruction Department, where you can say to the instructors, I want five, ten, twenty, thirty, or whatever it may be, operatives who can do so and so, and I want them taught to be able to do this or to be able to do that, because it is no use for the instructors to use their own ideas of what your men want. Now, they are going to take raw material and turn it out to you in a half-baked condition. You will have to finish the cooking, and also decide for yourselves what the preliminary process of cooking has to be.

In all probability we shall have to increase the size of the factory materially in the near future. We must purchase more machinery, and that means, of course, more machinists or apologies for machinists. I want to keep the help just ahead of the machines if I can. In other words, if we order a lathe or a grinding machine today, the probability is we shall not receive it for three or four months, but by the time it comes we must have someone ready to work it. You can't wait until the machine gets here, then say you want a man for it, because he isn't there. We have got to start him here first and make him.

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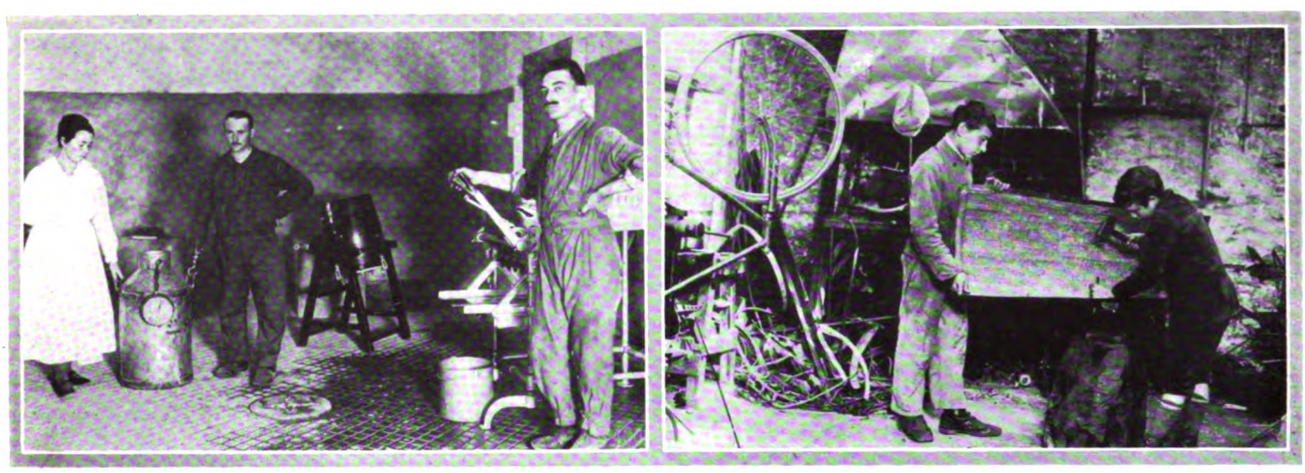
American Red Cross Reconstruction of the Injured

THE problem of restoring the crippled and mutilated of battle as far as human ingenuity can go has assumed increasing importance. So great has been the progress in this direction, that today there are thousands of these unfortunates, who previous to this conflict would have been regarded as hopelessly maimed, who now go about their daily work practically unnoticed and nearly as efficiently as before.

At one institution that is operated under the auspices of the American Red Cross, the efforts of the most highly skilled experts obtainable are devoted wholly to the reconstruction of human faces that have been in part or almost wholly destroyed by the agencies of war. Through the wonderful work of these sculptors and artists, men that previously were forbidden to appear in public because of the ghastliness of their wounds, are now able to mingle among their fellows almost unnoticed. Many difficulties are met in reconstructing these faces. If, for instance, a cheek and lip have to be replaced by a mask, the problem of how to make it hold firmly in place arises. Another sufferer may object to wearing spectacles that would assist in retaining his artificial nose in position, and means must be discovered whereby his objections may be overcome.

The first step in the reconstruction of such faces is to make a reproduction. From this mold a positive cast is made, and upon this the face-to-be is modeled in plastiline. By careful study of photographs of the patient before he received his injuries, and by following the suggestions of the man himself, good likenesses are generally obtained. In case he has a brother resembling him, assistance may be gained by the sculptor from studying the features of the other man. Where eyes are to be replaced of the same color and type as those lost, should the patient or his friends remember someone whose eyes resembled those of the injured man, the other person is sought and these features copied by artists.

When the new face is finished and approved by the patient that is to wear it, it is sent to an especial plant where it is gradually reduced until its thickness is no greater than that of a stiff piece of paper. The face is light, comfortable, and does not twist or warp out of shape. There is no pressure on the facial parts. Space is provided for ventilation and for dressings if surgical treatment is required. These faces are painted to resemble the natural hue, the greatest skill being required in these finishing touches. Fine copper threads soldered in place furnish the eyelashes. When the mask includes a mouth and the one who is to wear it so desires, the lips are left far enough apart to enable the wearer to smoke a cigarette.



AT LEFT—CRIPPLE HOLDING MILK-CAN WITH HOOK INSTEAD OF A HAND AT THE RED CROSS FARM IN FRANCE.
AT RIGHT—REFUGEE CHILDREN LEARNING TRADE IN SHOP ESTABLISHED BY RED CROSS.

Another American Red Cross activity has been the purchase and equipment in France of a farm for cripples. Here men who have lost arms and legs are furnished with artificial ones so designed that they can hold the implements required in farm labor. By means of these special members those using them are enabled to do most farm work. They hoe, spade, run farm machinery, make hay, cultivate gardens, and in fact run practically the whole scale of farm employment.

The approval of gratitude of the French government respecting this work may be appreciated from the fact that it has assigned wards in Paris hospitals to which soldiers with facial wounds may be sent from all parts of France. In order that these unfortunates, who have suffered so terribly, may receive all the aid that grateful humanity can bestow, the Christmas Roll Call is being sounded.

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Foreign Trade Extension

THE annual convention of the American Manufacturers' Export Association was held at New York, October 30 and 31. A number of interesting papers were presented, some of the more important being abstracted below:

The Webb-Pomerene law facilitating combinations in the export trade was discussed by G. H. Montague, who was attorney for the Association during its efforts for the passage of the law. Contrary to the general idea, the law is of assistance not only to manufacturers handling their products through joint selling organizations, but also to others selling to foreign countries. In fact it is of advantage whenever conditions in particular markets abroad or in particular industries at home call for an arrangement between competing concerns regarding the allotment of export orders, prices to foreign buyers, terms of export sales, credits to foreign customers, grades of export products, allocation of foreign markets, pooling of foreign business, apportionment of output for export, or division of sales territory abroad. Hitherto, when American exporters attempted agreements covering any of these points, they were in danger of violating the anti-trust laws. Without such agreements they were at a great disadvantage in competing for foreign markets with strongly-organized manufacturers from other countries. The Webb-Pomerene law permits such agreements through the formation of so-called export associations, provided they do not restrain trade, affect prices, or lessen competition within the United States.

Webb-Pomerene law a help to nearly everyone engaged in foreign trade.

Several joint selling organizations have formed export associations since the passage of the law. The usual procedure is for the interested manufacturers to subscribe the stock of the corporation, which handles the selling of all products, selling charges and division of profits being determined in various ways. Allocation of orders and similar questions are usually decided by the directors of the corporation. However, it is not essential that the export association should handle the actual selling of the products in the foreign market. This may sometimes be handled more advantageously by arrangements with an established export house, with the branch house of some single exporter, not necessarily a member of the export association, with a local dealer, or even with an individual traveling representative.

Extension of foreign credit was discussed by E. A. De Lima, president of the Battery Park National Bank. Credit arrangements should be based on the personal investigations of a carefully selected representative. This representative should preferably speak the language of the country as well as know the goods he is selling, but if a choice must be made, it is better to send a representative that knows the goods but cannot speak the language rather than one that can talk intelligibly but not intelligently. The contrary method has too often been followed in the past. Information regarding credit risks can also be obtained from banks having foreign connections, but such information cannot take the place of that obtained through personal representatives.

Foreign credits should be based on the same general principles as domestic credits.

It is better to send a representative that knows the goods but cannot speak the language than one that can talk intelligibly but not intelligently.

Business may be done directly with the foreign buyer or through an export commission merchant. Manufacturers have in the past unconsciously retarded the development of foreign trade by demanding cash on delivery from the export commission merchant, whereas 30 to 60 days or even longer credits should be given, following the general rule of European manufacturers. The banker has a large part to play in the development of foreign trade, particularly in the establishment of foreign connections. There must be a free and open discount market in this country where acceptances may be sold as readily as in the other markets of the world.

In discussing the same subject, J. H. Tregoe, secretary-treasurer of the National Association of Credit Men, called attention to the need of co-operation between the credit managers of foreign departments in exchanging information regarding individual credit risks. Information may also be obtained from both the Department of State and the Department of Commerce regarding general conditions affecting credit in a given country.

'How a Manufacturer Can Establish His Own Organization Abroad' was discussed by William Ingersoll, of Robert H. Ingersoll & Bro. Many exporters will prefer to market their products in some other way than by the establishments of one or more foreign branches. A foreign sales organization requires investment, financial risk, a first-hand knowledge of local conditions, and a higher order of organizing and administrative ability than any other method of foreign selling. The establishment of a branch in a foreign country should, if possible, be preceded by a survey of conditions on the ground. Where such a trip is impossible, a certain amount of information may be obtained from the Government agencies, from the banks, and from the various business associations. The preliminary survey should include consideration of such questions as whether the

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goods are or can be adapted to the requirements of the market, whether the ultimate market is large enough to warrant establishment of a branch, the necessary investment and the length of time that may be required before the branch can be placed on a paying basis, whether the volume of sales will be sufficient to carry the overhead of the branch, and if not, whether other goods can be added to reduce the proportional overhead. Transportation facilities, tariffs, cost of doing business, and labor supply, all have a part in determining where the branch should be placed.

The kind of man to place in charge of the branch is important, as well as his assistants. He will have much greater responsibility than a man in a similar position in this country. If a man is appointed in charge, he should be permitted to manage, free from all restrictions, save those necessary for home office control. The foreign-branch manager should be encouraged to develop men in his own organization, and when desirable to send them to the home office for further training. Future branch managers can often best be developed in this way. Occasional trips to the home office by the branch manager will help to maintain co-operation.

If a man is appointed in charge, he should be permitted to manage, free from all restrictions, save those necessary for home office control.

The particular case of the development of the foreign sales organization of the Remington Typewriter Co. was described by J. F. McClain, director of foreign sales for the company. At first the company worked mainly through dealers selected from local merchants, rather than agents. This method proved unsatisfactory, principally because the dealer was inclined to sacrifice other considerations to immediate profit. A change in policy was therefore adopted. Where the local dealer's business was worth buying, it was bought outright, and additional branch houses were established as fast as men could be trained to head them. At the same time an organization composed of citizens of the country itself was built up. Even in India there are a large number of native salesmen, mechanics, and other employees, who have been trained carefully in their respective duties under the direction of an American general manager of long experience. By combining expert leadership and American initiative with the knowledge of native employees, the company has had remarkable success in adapting its machines to the varied needs of different nations. Many American efforts to build up foreign trade have failed because of the disinclination to adapt American products to the needs (or to the tastes or fancies, maybe) of the foreign user.

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Disabled Men Make Good in Industries

According to an investigation of disabled men in actual employment throughout the country, made by the Red Cross Institute for Crippled and Disabled Men, these workers show a marked disposition to save money and invest it in homes. One large factory, employing hundreds of cripples, reports that many of them are real-estate owners. This indicates what may be expected of the War cripples when they re-enter industry. The Institute, through its employment department, has placed many cripples in paying jobs. Each case was investigated at intervals and the progress and general efficiency of the worker noted. Men were placed in brass work, electrical manufacturing, auto accessories, a lace factory, printing shops, shoe-making establishments, the retail hardware business, and many other activities. Letters received from employers about these workers were appreciative of them. Usually the employers asked for more help of the same kind. These results agree with those in the warring European countries.

From sources outside of New York, reports have been received which show that 85% of the crippled workers are as efficient as an able-bodied man. This is in spite of the fact that few of these men had received special instruction in how to do every-day work with their limited facilities. Employers say that these men try constantly for improvement and are remarkably steady. They are not absent from work on account of ill health more frequently than able-bodied men. Foremen and superintendents of shops are showing more inclination to employ cripples than formerly. Some will even give preference to them. An important element in the cripple-labor situation is the attitude of able-bodied workers toward the handicapped men. There is no resentment, the attitude of the able-bodied men being one of encouragement. The cripple is accepted as a practical worker, entitled to the same consideration that the sound man receives.

The men who have been under observation were for the most part hurt in factories and on railroads or in other processes of civil life. There are only a few War cripples among them. But they are workmen of the American type and for that reason they can be considered fairly representative of those who will return from Europe. The soldiers, however, will have the advantage of special education for whatever they attempt. This should make them, if anything, better workmen than the cripples now employed.

I HEAR you received an ovation when you spoke at the meeting the other night.

No, it was a brick.

"I HEAR that your cook left you."

"Yes, she quit because we wouldn't pay her enough so that she could eat at a restaurant."

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The Ferro-Alloys

By J. W. RICHARDS

THIS is an abstract of a paper read at the National Exposition of Chemical Industries. Besides the more familiar alloys used in the metal industries, some of newer ferro-alloys are discussed.

FERRO-ALLOYS are of great importance to the steel industry. The steel-maker uses them for two purposes: (1) As reagents to take oxygen out of melted steel and thus ensure sound solid castings (ferro-manganese, ferro-silicon, ferro-aluminum). (2) To put into the steel a portion of the rare metal (ferro-manganese, ferro-chromium, ferro-tungsten, ferro-molybdenum, ferro-vanadium, ferro-titanium, ferro-uranium, ferro-boron). Melted steel, just before taking from the furnace, always contains some oxygen dissolved in it, like the dissolved gas in charged soda water. If this is not removed, the casting is unsound from cavities or blow-holes. The addition of a small amount of an element or metal with a high affinity for oxygen removes this element and makes the casting sound. Manganese in the proportion of 1% or less, is the cheapest and most generally used reagent for accomplishing this; silicon to the extent of ½% or less, is more powerful, but also more expensive, and is often used to supplement the action of manganese; aluminum, 0.1% or less, is still more powerful and still more expensive, and is used in very small quantities as a final addition to complete the action of the manganese and silicon.

The second use is to make special steels, that is, steels containing such quantities of the rare metal as give to them properties different from plain carbon steels deoxidized by manganese, silicon, or aluminum. Thus we may make manganese steel by putting in 12 to 14% of manganese, making a very tough hard steel, such as is used in mining and grinding machinery and burglar-proof vaults; 2 to 4% of chromium makes a very hard tool-steel; 15 to 25% of tungsten makes high-speed tool-steel, which cuts iron while red hot; 6 to 10% of molybdenum has powers similar to tungsten, and is also used in steel for lining large guns. Vanadium in quantities from $\frac{1}{10}$ to ½%, makes very strong steel which resists shock extremely well, as when used for automobile axles; titanium, uranium, and boron impart valuable properties not so easily described. Every one of these materials is used for producing some specific result which is not produced by any other. The value of these special steels to the industries, and particularly for military purposes, is very great, so great that the supply of ferro-alloys for their manufacture is an important factor in winning the War.

FERRO-MOLYBDENUM. Molybdenum has only recently come into large use in steel. Its action being somewhat similar to tungsten, scarcity of the latter metal, particularly in Europe, has led to the manufacture of ferro-molybdenum on a comparatively large scale. The ores are widely distributed, but not plentiful. The sulphide, molybdenite, used to be roasted to molybdenum oxide, and this reduced by carbon in the presence of iron ore or scrap-iron in an electric furnace. It is now smelted directly in the electric furnace with carbon and a large excess of lime along with iron ore or scrap-iron. Ferro, with 50 to 60% of molybdenum, is tapped from the furnace like other ferro-alloys, but with molybdenum up to 80% the alloy has such a high melting-point that it cannot be tapped without freezing; it is necessary to make a furnace full of this alloy; then let the furnace cool down and take it apart, taking out a large mass of solidified alloy; the furnace is then re-built. The large use of molybdenum in steel has been so recent that not much has been made public about it. Rumor says that the large German guns, the 'Black Berthas', which bombarded Liége, were lined with 6% of molybdenum steel to increase their resistance to erosion. It seems certain that Germany drew considerable supplies of molybdenite from Norway to compensate for shortage of tungsten for high-speed tool-steel. Parts of guns, gun-carriages, motors, automobiles, have also been made of molybdenum steel of most excellent quality. Canada has been especially active in the manufacture of ferro-molybdenum, most of which it exported to Europe. This alloy is therefore another pre-eminently valuable war material.

FERRO-VANADIUM. Without vanadium the modern automobile or auto-truck would be a much weaker machine. When steel is desired to withstand the heaviest shocks and vibration, nothing is so effective as vanadium. This is another comparatively rare metal, found principally in the radium ores of Colorado and as a black sulphide on the highlands of Peru. The canary yellow Colorado ore is treated for radium and the residues for vanadium and uranium. The U. S. government operates this process for the radium supply. The black ore of Peru is rich and unusual; it is a sulphide with some asphaltic matter, and it is roasted and brought into the condition of iron-vanadium oxide before reduction. The oxides are best reduced by metallic aluminum—vanadium oxide plus aluminum produces vanadium plus aluminum-oxide slag. This is the well-known 'thermit' (Goldschmidt) method of reduction. Electric-furnace reduction by carbon is not advantageous because of the large

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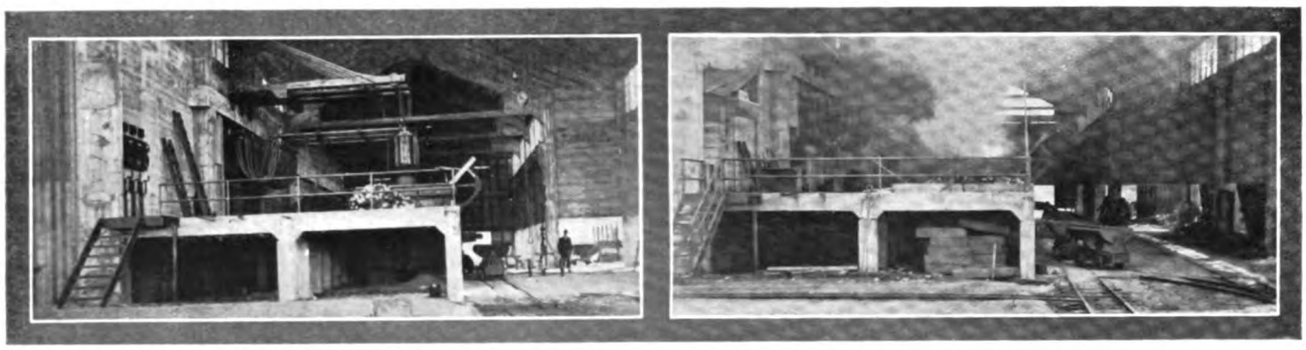

ELECTRIC FURNACES MAKING ALLOYS AT BAY POINT, CALIFORNIA

amount of carbon taken up by the alloy; powdered silicon is therefore put into the charge as the reducing agent, together with iron, lime, and fluorspar, and then a 30 to 40% vanadium alloy is obtained with seldom over 1% of carbon—a very desirable composition. Only small amounts of vanadium are necessary in improving the steel; 0.1 to 0.4% are the usual quantities. This is fortunate, because vanadium costs $5 per pound and over. Metallurgists suspect that part of the improvement of the steel may be due to the vanadium combining with and removing nitrogen dissolved in the melted steel. This is probably true, yet some advantage undoubtedly must be ascribed to the final vanadium content; steels thus treated are unusually resistant to shock and alternate stresses, making them useful for axles, cranks, piston-rods, and such severe service.

FERRO-TITANIUM. Titanium is an abundant element in nature. It occurs in immense amounts as a double oxide of titanium and iron, known as ilmenite, or titanic iron ore. This ore can be reduced directly by carbon in electric furnaces to ferro-titanium. The reduction proceeds easier if some aluminum is put in as a reducing agent, but this is expensive and unnecessary. The alloy, running 15 to 25% titanium, is sold for use in steel as a refining agent to remove oxygen and nitrogen. Thousands of tons of steel for rails have been treated thus, the tests showing considerable improvement in the mechanical properties by the use of small amounts (0.10 to 0.20%) of titanium. Only one firm in America makes this alloy, and its use in steel has not yet gained universal approval.

FERRO-BORON. This is an alloy whose valuable qualities have not yet been entirely determined. Boron is the metallic base of borax, which is a sodium-boron oxide. Borax is difficult to reduce. Another raw material, not so abundant, is colemanite, containing lime and boron oxide. Many attempts have been made, none very successfully, to reduce this with iron oxide to ferro-boron. The American Borax Co. offered a prize for several years for a process that would accomplish this. Boron oxide occurs rarely in nature, but it can be manufactured from borax and colemanite. When the oxide is obtained this can be combined with iron oxide and the resultant boron-iron compound reduced by carbon in the electric furnace to ferro-boron. Small quantities of this alloy have been manufactured. Experiments on steel have shown that ferro-boron acts somewhat similarly to ferro-vanadium. Experiments in France showed remarkably strong and tough steels were thus made, using 0.5 to 2% of boron.

The ferro-alloys are exceedingly important materials to the steel-maker. They are indispensable. They are important factors in producing both ordinary and fine steels, and therefore in winning the War. The country well supplied with them has a great advantage over the country in which they are scarce. They are deserving of all the expert attention which they are receiving from the War Industries Board, the steel-makers, and the economists. The possession by the United States of large supplies and resources for the ferro-alloys may be one of the important factors in determining the quick ending of the War.

GUS GORCHE has about decided that he will either have to remove the pencil-sharpener from its position above the telephone at the Crawford Candy Shop or post a notice explaining that the telephone is a self-starter and requires no cranking. A woman from a party traveling by auto through town yesterday came into the Crawford to call up a friend who lives here.

Before taking down the receiver, she gave the pencil-sharpener the spin of its young life, after the time-honored method used on country lines where it is necessary to ring on and ring off. The operator responded with the required connection, but there was no answer, and so, after a short wait, the pencil-sharpener was again resorted to in the effort to flag the hello girl. With no immediate reply from central the visitor gave the sharpener one final twist and departed.—Willows Journal.

A LOCAL MANUFACTURER that lost most of his mechanics to the shipyards conceived the bright idea of gathering together a bunch of alien-enemy mechanics who were not permitted to work in the shipyards. As a result he is turning out sub-contracts for the Government with an extremely steady crew, many of whom cannot speak English.

THE coke nowadays doesn't have to be broken with a hammer.

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Purchasing Raw Material by Specification

By WELTON J. CROOK

BUYING a 'pig in a poke' is poor business, yet buying raw materials in metal industries without examination and analysis is not much better. In this article, a member of the chemical staff of the Pacific Coast Steel Co. shows that a laboratory is usually a paying investment even for a small concern.

THE subject of raw-material purchasing is one that has received much study by large manufacturers, but its importance has not been fully recognized by smaller firms. Preparing specifications for contract and for examination of raw materials involves a number of important questions, the most important being 'What grade of material is acceptable for the purchaser's purpose?' In the steel industry this usually means, what are the most objectionable impurities and what proportion of these impurities can be tolerated with the proper economy? The answer to such a question must come, of course, from the men who are actually controlling the operations and should not be guessed by a non-technical purchasing agent. Take, for example, limestone to be used as a flux in the basic open-hearth process. The most undesirable impurity is silica. A small amount will give no trouble; 1% will cause no more difficulty than will ½%. To specify a limit of ½% silica in limestone when 1% will do, would be an error, because the shipper would undoubtedly charge a higher price in order to cover possible rejections.

The second question is whether all possible objectionable impurities have been covered by the specification, and whether a desirable physical condition of the material has been designated. Turning again to limestone, cases have arisen in which it was found that the shipments contained sulphur in too great quantities. Since this impurity is uncommon in limestone, it was not covered by specification, and argument between buyer and seller ensued. Regarding physical condition, great loss may result to a purchaser if a car of limestone should be made up largely of fine dusty material, since as much as 20% may be blown away when unloading in windy weather.

A third consideration should be the method of sampling. There are two possibilities: the sampling may be done 'on the car', or it may be done while unloading. 'On the car' sampling is somewhat unsatisfactory both to buyer and seller, except with material of uniform composition, shipped in a comparatively thin layer on the bottom of a car. The sampler can seldom reach the material near the bottom and his sample may, therefore, not represent the average of the lot. This matter becomes of importance in determining loss on ignition for quicklime shipped in bulk, and to a lesser degree, for calcined magnesite. Shippers of quicklime may claim that the car contains several 'drawings' from the kilns and that, although the top may not be quite up to specifications, the bottom is better, making the average of the car of an acceptable grade. Demand will then be made that the alternative method of sampling be practised, namely, sampling throughout the unloading. On the other hand, sampling 'on the car' may react against the buyer, particularly when determining the moisture content of coal and coke. Coke shipped in either open or closed cars during dry weather is likely to show a much lower moisture content on the top layers than on the bottom.

When sampling during unloading is used, a specification should contain a definite understanding regarding the allotment of the expense for re-loading and disposal of rejected cars. So few contracts contain this clause that those in charge of the acceptance and refusal of raw materials generally lean toward the method of sampling 'on the car', notwithstanding its possible inaccuracies.

A fourth question is that of 'dirty cars'. Limestone has been rejected even without sampling because the shipper had loaded cars containing a layer of gravel on the bottom. It would be impossible and impractical to separate this gravel from the limestone, and being silicious, the gravel would have a most detrimental effect in a basic furnace.

Besides the price and time of delivery, the specification should cover (1) high limits of all possible objectionable impurities, and lowest content of desirable constituent; (2) proper physical condition; (3) the method of sampling to be used; (4) distribution of charges for reloading and disposing of material not up to specification.

It is, of course, understood that the buyer making such contracts has in his organization a well-equipped laboratory with a capable inspector to pass judgment on the raw materials which come into the plant. However, it is a lamentable fact that comparatively few of the smaller buyers have the breadth of vision which enables them to recognize the commercial value of such a department to their business. The maintenance of a laboratory is an expensive operation, but it is certainly a paying investment. Materials bought without specification and without inspection and analysis are generally much more costly than is realized. For example, take a certain ship-

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ment of fluorspar to be used as a furnace-flux in the basic-steel process. Such material costs over $30 per ton. It was found to contain about 20% of silica, which means that for each thirty-ton car the buyer would be paying nearly $200 for useless material. Furthermore, if a flux of this character is used in a basic-steel furnace, there is danger that many tons of steel will be ruined through high sulphur content.

If, in a plant buying eight or ten or more cars of raw materials per day, account be kept of the saving made by the inspection laboratory, and this compared with the laboratory expense, the laboratory will have a large credit-balance. There will also be the added advantage that when difficulties arise in the manufacturing process, solution of the problems will be found more readily if an accurate analysis of every car of raw material has been kept.

One of the arguments most likely to be urged against such specifications as have been outlined is that undue delay would be experienced before analytical results are received, especially in the case of sampling 'on the car' and where cars are not unloaded until analyses are completed. In most cases this objection is invalid. At one plant, where an average of approximately 150 cars of raw materials is bought on specification per month, representing about fifteen kinds of material, the laboratory employs three chemists, three assistants, and one sampler, each working eight hours per day. Their routine includes not only the determination of all raw materials received, but the analysis of the finished products made in the plant, and control samples from the various operations. Cars are available for sampling on the railroad company's tracks at noon, and analytical results are always reported by seven the next morning, at which time the cars are 'spotted' for unloading. Cars are ready for acceptance or rejection without a minute's delay chargeable to the laboratory department.

It is suggested that buyers with laboratories furnish small sellers with the analyses of their car-loads, in order that the best material be sent. In one case dolomite containing 0.75% silica was being shipped to a basic open-hearth steel plant when the shipper could just as well have supplied 0.20% grade, had he known the analysis of the different lots.

ZIP ROSS says, "Down in the Ozark mountains if a fellow lays six bits down on a stump and hoots like an owl he can get a whole quart of moonshine spirits; but that does not help anybody living in my parts—we get too dry to hoot."

ONE of the stenographers in our office says she transcribed so many letters yesterday that last night she finished her prayers with "Yours very truly."

THE wife of one of the editors of 'Metal Trades' says that his gas-mask improves his appearance so much that she wishes he would wear it all the time.

Latin-Amercani Demand for American Steel

Latin-American concerns wishing to specify American structural steel for building and railway purposes can now do so without difficulty by referring to pamphlets in Spanish and English just issued by the Bureau of Foreign and Domestic Commerce, Department of Commerce. These pamphlets are intended to facilitate sales of such materials in Latin countries, and are published in response to numerous requests from those countries. The text defines with scientific accuracy the generally accepted American standards, as adopted by the American Society for Testing Materials. The publication of the series has been made possible by the co-operation of the American Society of Civil Engineers with the Bureau of Standards and Bureau of Foreign and Domestic Commerce of the Department of Commerce. The five pamphlets announced today are: 'Standard Specifications for Structural Steel for Buildings', 'Standard Specifications for Structural Steel for Locomotives', 'Standard Specifications for Carbon-Steel Bars for Railway Springs', 'Standard Specifications for Quenched and Tempered Carbon-Steel Axles, Shafts, and Other Forgings for Locomotives and Cars', and 'Standard Specifications for Carbon Steel Forgings for Locomotives'. These can be purchased at five cents per copy from the Superintendent of Documents, Government Printing Office, Washington, D. C., or from the district office of the Bureau of Foreign and Domestic Commerce, 307 Custom House, San Francisco.

"Eclipse eikossi ex aikossi pendi!"

A value of $2000 is placed on each of these five words by Simeon Emmanuel, a Greek priest, for alleged slander. The priest demands a total of $10,000 in damages from his alleged slanderous countryman. These words are said to convey the information that Simeon Emmanuel is alleged to have stolen about $26. The theft charge, he says, was publicly made by the defendant and he demands balm for his outraged reputation.

A BOER who fought with the British forces in the East African campaign was recently operated on for extraction of a bullet. Shortly afterwards an English surgeon remarked to him, "By the way, we took two bullets out of you. Did you know there were two?" "Oh, yes," replied the Boer; "one I got from the Germans and the other from you beggars at Colenso."—Manchester Guardian.

WU TING FANG is said to have been responsible for this one. He once mentioned the case of a Chinaman who committed suicide by eating gold-leaf.

"But how did that kill him?" asked one of his hearers.

"I suppose," said Wu, "that it was the consciousness of inward gilt."

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The Wastes of the West—II

By Miner Chipman

ORGANIZATION

NO ONE will deny the assertion that the Musicians' Union of San Francisco is a powerful and effective organization. If rules and regulations are to be accepted as a measurement of trade-union efficiency, the Musicians' Union registers 100% perfect. There is no more dictatorial and arbitrary organization in existence. Strange as it may seem, this organization of musicians is as inconsistent as it is arbitrary. The Musicians' Union is not in harmony with the trade-union movement. Insofar as I am aware, it is the only trade-union that accepts scientific management. Organized labor is utterly opposed to scientific management, and yet the Musicians' Union accepts it in theory and in practice. The members of the Musicians' Union do not know it, but a theatre orchestra is the finest example of organized scientific management in the world. An attempt to apply the same principles and practices in a machine-shop would cause an immediate strike. The Musicians' Union would strike in sympathy with the machinists, and no one would question the consistency of the action.

A theatre orchestra is the finest example of scientific management in the world. An attempt to apply the same principles and practice to a machine-shop would cause an immediate strike.

An orchestra must have a boss. No one questions the necessity of having a competent foreman of an orchestra. He employs his men upon the highest principles of vocational fitness. Every man is employed for a particular job, and the foreman assures himself of the man's fitness for that job before he is permanently employed. The Musicians' Union accepts these principles of employment without question. This Union has never made a complaint concerning the specialization of its members. The fact is that the Musicians' Union is not a trade union at all. It is essentially an industrial union. Strictly speaking, the Musicians' Union should be divided into an infinite number of crafts. There should be a Drummers' International Union, a Brotherhood of Cornetists, a Friendly and Fraternal Society of Violinists, etc. The Musicians' Union as now organized could not exist if it were not for the fact that scientific management is the basis of operation. If an orchestra leader desires to employ a violinist he does not call up union headquarters and ask the secretary to send him a musician. Oh, no! The orchestra leader is specific. The union secretary sends a specialist. It does not matter how many drummers, cornetists, or trombone artists there may be idle. No complaint is made, and a violinist gets the job. The Musicians' Union has accepted the highest standards of scientific employment. No other union will stand for such fine specialization.

Let us see how scientific management works in the theatre orchestra. First of all, the workers provide their own tools. Every one of them insists upon having an instrument that will deliver, in an effective and efficient manner, the product of his ability and his labor. They file into the orchestra pit, and proceed to get in tune with one another. The boss comes in. The orchestra has every appearance of a gang organization with a gang boss at the head of it. This gang boss is systematic. He has a package of papers. These papers are written instructions for his workers. No machine-shop under scientific management ever operated upon such minute instructions. Nothing is left to discretion or initiative. These instructions, commonly known as 'sheet music', are no more and no less than Taylor System instruction cards. Frederick W. Taylor, himself, never attempted to make instruction cards so minute in detail, or so arbitrary in character. Yet every one of these loyal union men accepts these instruction cards as a matter of course. We hear no cry of 'System'! We hear no complaint whatsoever concerning the issuing of these instructions. Yet, find a machinist in the Machinists' Union that would accept an instruction card covering the detail of his work. He would consider such a procedure an affront. It would be an insult to his finer conceptions of workmanship. It would be a reflection upon his ability and experience as a machinist. If these instructions confined his work to a certain machine and a particular method of work, he would consider himself imposed upon, and would notify the business agent that his boss was trying to make a specialist out of him. The business agent would take immediate action. Yet this is all commonplace with the Musicians' Union. When the right moment arrives, the gang-boss shakes a stick (the Musicians' Union calls it a baton), and every man in the gang is at 'attention'. He strikes a gentle blow upon the lamp-shade with his powerful stick, and they start to work. When they have once started a job they finish it. There is no let-up. They stick to it until it is finished.

No machine-shop under scientific management ever operated under such minute instructions as a theatre orchestra.

When the theatre orchestra starts a job they finish it. There is no let-up. There is no restriction of output.

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There is no talk of fatigue. No one runs away to get a drink or take a rest. There is no restriction of output. Who ever heard of the Musicians' Union restricting the number of notes produced per hour. If this labor union wished to be consistent with other unions it would insist upon jobs having just so many notes per minute. What is known as 'speeding up' in the machine-shop is called 'Allegro' in the Musicians' Union. 'Ca canny' in the machine-shop is 'Adagio pesante' in the orchestra.

The reason for this vast difference between the Musicians' Union and the ordinary trade union is to be found in its principles of organization and operation. The workers have confidence in the leadership of the boss. Every member of the organization knows his fitness, and the fitness of every other member of the group. He has confidence, not only in his own ability, but in the combined ability and skill of his fellow workers. His boss knows what is to be done and how to do it. Harmony is accepted as an essential. Harmony cannot exist without harmonious instruction and competent leadership. Every member of the Musicians' Union knows and recognizes the principle of 'competent counsel'. He knows that perfection and efficiency in his trade is measured by standards of excellence that are attained only by study and great patience. He accepts joyfully the suggestions and criticism of the expert. Efficiency in the Musicians' Union is the attainment of perfection, and that perfection which is found in the masters of the art. No real musician will permit a fellow worker to destroy his efforts with inharmony and discord. His trade unionism does not go as far as that. Discipline of the highest order governs the theatre orchestra. The foundation of this discipline is to be found in leadership. The orchestra is known by its leader.

How nearly does the average factory approximate the organization of the orchestra? It is possible that the difference between the Machinists' Union and the Musicians' Union may be found in the difference in the character of leadership that directs the workers in these trades. How many managers, how many foremen, know what is to be done and how to do it? I do not mean HOW in a general way. I mean definitely and specifically. How many foremen know just how much work there is ahead of him; just how many hours there is for each machine? How many managers impress their workmen with the confidence of leadership? It may be possible that the ugly words: sabotage, restriction of output, and 'ca canny', express the reaction of the workers to incompetent and poorly organized direction. As the orchestra is known by its leader, so the shop is known by its manager. The leader of an orchestra is responsible for the harmony in his organization. The manager of a factory is responsible for its discord and inharmony.

It is possible that the difference between the Machinists' Union and the Musicians' Union may be found in the difference in the character of leadership that directs the workers in these trades.

The reason why the foreman of an orchestra has such perfect control over his output is a simple one. He has definite written plans of operation. Nothing is left to discretion or guess-work. The execution of these plans has his personal and undivided attention. His workers perform their jobs according to his plan, note by note, moment by moment. Playing by note is not playing by ear. I have seen an orchestra in a theatre on Broadway playing the score of a musical comedy for the one hundred and sixteenth time, by note. In an orchestra, efficiency is secured by competent leadership, employment according to fitness, and a rigid system of direction and control.

The foreman of an orchestra has perfect control over his output because he has definite written plans of operation.

We do not seek any such perfection of performance in factory organization. We do not aim even to approximate the same result. Competent leadership can be secured, standards of employment can be attained, and there is a best way of doing a particular job. Next month we will discuss the question: What does it mean to be a manager of men?

WHILE his mother was away on a visit Johnny didn't say his prayers. Upon his mother's return there was a reckoning.

"Why didn't you say your prayers, John?"

"Well, you see, it was this way, ma; I forgot to say them the first night an' nothin' happened. 'N then I didn't say them the next night an' nothin' happened, 'n so I decided I wouldn't ever say 'em again if nothin' never happened."

And then something happened.

"THE restriction upon the importation of Roquefort cheese (item 113 of List of Restricted Imports No. 2, W. T. B. R. 98) has been modified by the War Trade Board in a new ruling (W. T. B. R. 302), effective November 4, 1918, to permit the importation of Roquefort cheese from France when coming as a return cargo from France when shipped from convenient ports and when loading can be done without delay." Hurrah! The country is saved!

A CERTAIN TAILOR who had enlisted was home on furlough. His wife asked:

"And did you see anybody you knew on the other side?"

"Sure," was the husband's reply. "I saw a couple of dozen men who owe me for suits of clothes; and say, dear, it's surprising how fast those fellows can get their gas masks on over there!"

"WHAT is the difference between a statesman and a politician?"

"A statesman wants to lead the people, while a politician wants to ride them."

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A Letter From the Front

A FEW days of rest and marching in a beautiful country, memorable swims in a cool river in an amphitheatre of hills, villages, and small imitation chateaux, one supper in a near-by town with a few friends and a little wine, and the over-strained and one-sided frame of mind in which I last wrote to you has entirely disappeared. Life, I suppose, and the War and politics and social and personal relations are all precisely the same today as they were four weeks ago, but to me they seem entirely different. Everything seems silly and pretentious, and less worth taking seriously (except outwardly in order to get along and to avoid unnecessary trouble) now that I have seen how short a step it is from life to death and how brutally human beings shove each other across the line.

As a little automatic-rifle man from Alabama said to me one morning in a wood full of corpses: "I've got the inclination to go on. I ain't unwilling to die, if need be —but I do hope I can get through this, so as to tell about my experiences on the field of battle." I think he had in mind some vague scheme for influencing future generations in favor of Peace. Not, of course, that he pretended to any doubts of the necessity or justice of our present war, only his own point of view as to the seriousness of it had so changed that he felt posterity should be set straight on the point.

The corner of the woods where I was talking to this soldier was honey-combed with small holes, each big enough for two men and each at that moment tenanted by two dead Germans, the remnants of their last day's rations of black bread, their few books and small correspondence, and, except where our men had taken it, their machine-gun. The ground in front of them was not badly sprinkled with dead Americans with their helmets and packs on. The night before the little rifleman's regiment had taken the place, mainly with the bayonet. The young Alabaman spoke in the quiet disinterested tone of one who is convinced of the vanity of things.

I am usually fairly sensitive to natural beauty and as I recall the physical features of that wood, which had a creek running through it, I am sure that had I run across it last spring in a day off from my ambulance work I should have considered it a beautiful place. It was on a beautiful July morning that I visited it; however, I have absolutely no recollection of beauty in connection with the place. Literally a sort of blackness seems to surround each vivid picture of that wood as I recall it. It was my first sight of the reality of war, the irrevocableness of death, and the aspect of hands and faces set like waxwork in the expressions they had taken on yesterday, and would continue to wear as long as they were discernible.

My mission in the wood was not to chat with the Alabaman, but to locate the front lines of the regiment on his left, in order that its supporting artillery might know where to fire and where to avoid firing. I had hardly done half of my work, however, when a lieutenant who was showing me his platoon line received a message which he turned over to me with a shake of the head and a half-shudder. It was an order for an immediate advance. When I handed him back the paper he was shaking all over as if undergoing an intense chill. "The same stuff Alabama pulled," said he, and then, bravely and unconcernedly: "It's so damned cold out here I can hardly stand still." In fact, the sky had clouded and a cool drizzle was falling.

The next officers I met were a captain and a platoon commander; they greeted me cheerfully: "Just add four kilometres to your range, please," said the Captain. "We're moving-up—you fellows have done very good work in the past, you surely won't object to a little change like that." I went back and took my post, with the Major, for the advance, and began a walk of about two hours and a half through woods and over ridges where the Germans had left their heavy ammunition and some of their dead, but no living man to trouble us. The end of that time found us—the advance battalion—on a broad hillside overlooking a rich deserted valley and a silent village on the other side of a stream. The Major was planning for the reconnaissance of the village, which looked ominous, and on the outskirts of which some Boche artilleryman was quietly adjusting a piece. To "adjust" is to fire on a spot whose position on the map is accurately known, in order to find out the exact variation from normal of the particular lot of ammunition you are using. Just then we saw a pretty and welcome sight: a patrol of eight or ten French cavalrymen, lances and all, strung out to about fifty yards apart, trotting briskly down a road in the valley to our right toward the town. They rode on until the first horseman was on the bridge leading to the gates of the town. Then we heard a machine-gun, the first Frenchman fell from his horse, and the rest galloped off up the valley to our left.

A rocket went up from the town and burst, showing one green star, and in about three minutes the Boche artillery began laying a light barrage between us and the town, leaving us untouched on the hillside. In a few minutes, an agreeable looking French officer walked up to where the Major and the rest of us were lying flat in a wheat-field, saluted formally, standing very erect, and joined us. By this time the Boche machine-gunners in the town had identified the Major and his staff and were giving us periodical attention, to my great concern. The infantry, by the way, are much more thoroughly terrified by high-explosive shells than by machine-gun bullets, owing, I think, to the big noise they make and to the

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nateful contortions into which they throw the bodies of those whom they hit. On the other hand, to me personally and to all other artillery-men with whom I have discussed the matter, machine-gun fire is much the more terrifying. We have a saving sense of the inaccuracies to which artillery is subject under the best conditions, we know that if one lies flat on the ground, or, better, in a depression, there is little chance of being hurt by anything less than a direct hit by the projectile itself, and the chances of such a direct hit are small. We know, moreover, that we can always hear the shell coming and tell whether it will land near us, and, if so, have plenty of time to flatten ourselves before it arrives. Machine-gun bullets, on the other hand, are not to be heard until they are actually passing, they always seem to pass between one's ear and shoulder, and they give one the unpleasant consciousness that before one has time to think another thought one may be irrevocably dead.

To return to the French cavalry officer: He reported to the Major calmly and in good English: "I cannot tell you where they all are, but I can tell you that one of their machine-guns is just across that bridge yonder, because one of my men was shot there." Another rocket went up from the town. This one burst into three white stars. A few minutes later the range of the Boche artillery began to lengthen and shells began falling among the forward elements of the battalion. At the same time I noticed something which, though much less dramatic than the high explosive fire, frightened me much more, namely, six or eight comparatively small explosions at intervals over our heads accompanied by puffs of white smoke in the air where the explosions were heard—in other words, shrapnel. Against troops in the open, shrapnel is far from being the kind of joke that high explosive shell may be. High explosive lands, partly burries itself, and explodes, throwing fragments up and out, so that the wise soldier, lying flat on his stomach, is in very little danger. Shrapnel, on the other hand, explodes in the air above the target and is so made that this explosion, like the explosion in the barrel of a shot-gun, drives forward and downward and scatters over the ground a large number of lead balls. Almost any kind of military shelter will stop these balls, but if you are in the open there is not much you can do to escape them, and a good artillery-man can thoroughly sprinkle considerable territory in a very short time.

When I saw the shrapnel bursting over our heads as we lay on that open hillside, I simply made up my mind to die, and I gritted my teeth and felt indescribably sick at heart at the prospect of seeing an entire battalion shot into debris. All the reasons I had for wanting to continue to live came back to me at once, and summarized themselves into a picture of a green lawn on a summer afternoon with the children playing in a sand-pile and mother handing me a glass of cool lemonade. Any reasons for disregarding the risk of death refused to come to mind and had to be dragged out—Wall Street, the law's delay, the rich man's contumely, the insufferable nuisance in daily life of keeping oneself respected by and on terms with a wrong-minded world, and provided with the necessities of a respectable existence. All these things, and the sweetness and propriety of dying for one's country, I rehearsed in a forced and artificial way. Finally, I stabilized myself to this point of view: whatever I may think of it, this thing must go ahead, and in all probability I must die or be severely wounded. I may just as well do it *avec un petit peu de chic* as in a shameful and demoralized way; it will mean the difference between making these hours, which in any event will very likely be the last of my life, quite tolerable and almost pleasant, by reason of a tickled vanity, instead of allowing them to be a hideous terror-stricken nightmare. In that frame of mind, substantially, I continued for the next three weeks. You will observe that my moral plane is much lower than that of any hero of fiction, patriotic speeches, or the newspapers, but, at least, I am describing it to you with absolute frankness. However, the business never did become pleasant. Toward the end I began to get used to it, and more indifferent than before, but there was never a time when I would have wished to prolong the War or my part in it for an unncessary instant for the sake of the joy or glory of the thing.

As for the shrapnel-fire that first afternoon, it stopped after those first eight or ten bursts, which hurt no one. Either the Boche had no direct observation by artillery officers, and therefore could not adjust his shrapnel satisfactorily, or he thought the range too long for good work with that weapon. The fire with high-explosive shells, however, continued—the range always lengthening. I ventured to suggest to the Major that it might be safer to withdraw his battalion back of the nearest crest, so that the Boche might not have the satisfaction of seeing whether we were where they were shooting and might thus be discouraged from firing. He did so, but we were still troubled by shell-fire. On our left flank, some of our men who had pushed out a little way came within range of another village containing machine-guns, and one of them was killed. It was the first killing that I witnessed, and again I felt sick at heart. I watched the distracted way in which his comrades tried to pick him up by his arms and legs and take him back to our line and ran for a stretcher.

It was now getting dark. The Major gave the order for his men to dig in. The situation was stabilized for the night and I went to report it to my Colonel. I started back with a young private who had been slightly wounded in the arm by a small fragment. He was glad to be going back, and I will admit that I was, too.

During the United War Work Campaign, an employer called his mechanics together at the noon hour to listen to a talk by one of the campaign workers. Altogether the men were held about five minutes. A few minutes later a committee of one came from the employees with the request that the men be given the extra time on the noon hour that they had lost listening to the speech. Needless to say, they didn't get it.

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New Priority List Issued by War Industries Board

UNDER date of November 11, the War Industries Board has issued circular No. 57, continuing in effect all former orders and circulars except as hereinafter modified:

Construction Projects Permitted

Section 5 of Revised Circular No. 21, issued by this Division as of date October 15, 1918, dealing with non-war construction, is hereby amended so as hereafter to read as follows:

"Construction projects falling within the following classifications are hereby approved, and no permits or licenses will be required therefor from the Non-War Construction Section:

"1. Construction projects approved in writing by the Facilities Division of the War Industries Board.

"2. All farm and ranch buildings, structures, or improvements.

"3. All buildings, structures, roadways, plant facilities, or other construction projects of every nature whatsoever, undertaken by the United States Railroad Administration, or by any rail or water transportation company, organization, or utility (whether or not under the direction of such administration) or by the American Railway Express Co., or by the owner or operator of any telegraph or telephone line.

"4. The construction, maintenance, improvement, or development by Federal, State, or municipal authorities or highways, roads, boulevards, bridges, streets, parks, and playgrounds.

"5. The construction, extension, improvement, maintenance, or repair of any public utility, including water-supply systems, sewer systems, light and power facilities, and street and interurban railways.

"6. The construction, extension, or repairs of all irrigation and drainage projects.

"7. Construction projects connected with the extension, expansion, or development of mines of every character whatsoever, or connected with the production and refining of mineral oils and of natural gas.

"8. The construction, alterations, or extensions of, or repairs or additions to, plants engaged principally in producing, milling, refining, preserving, refrigerating, or storing foods and feeds.

"9. The construction of new, or the alterations or extensions of existing, schoolhouses, churches, hospitals, and Federal, State, or municipal buildings, involving in the aggregate a cost not exceeding $25,000.

"10. The construction of new buildings or structures not embraced in any of the foregoing classifications, or the repairs or additions to, or alterations or extensions of, existing buildings and structures, in either case involving in the aggregate a cost not exceeding $10,000.

"11. The construction of new buildings or structures not embraced in any of the foregoing classifications, or the repairs or additions to, or alterations or extensions of, existing buildings or structures, in either case involving in the aggregate a cost not exceeding $25,000, when approved in writing by the State Council of Defense or its duly authorized representative.

"12. Buildings begun prior to September 3, 1918, where a substantial portion of the building has already been constructed."

Restrictions Upon Production of Building Materials Removed

All limitations on the production of building materials, including brick, cement, lime, hollow-tile, and lumber are hereby removed, and the materials so produced may be sold and delivered for use in connection with any building project for which no permit or license is required under revised priority circular No. 21, as further revised above, or to any project authorized by permits or licenses issued in pursuance of said circular. All limitations upon the production or use of lime or crushed or pulverized limestone in any form for agricultural uses are hereby removed.

Restrictions Upon Industries Relaxed

Restrictions upon industries and manufacturers in their production of, or in their consumption of materials for, commodities hereafter in this section enumerated, as such restrictions are expressed in orders and circulars issued by this Division, are hereby so modified that such restrictions for the respective periods provided for in such several orders and circulars shall be less than the restrictions provided for in such orders and circulars to the extent of 50% of such restrictions. To illustrate: Where an industry for the last four months of 1918 has been curtailed 25%, such curtailment is hereby changed to 12½% for such period; where it has been curtailed 40%, such curtailment is hereby changed to 20%. The commodities referred to are as follows:

1. Agricultural implements and farm-operating equipment, including tractors.
2. Road-machinery.
3. Coal, coke, and wood burning cooking and heating stoves and ranges.
4. Gas-ranges, water-heaters, room-heaters, hot-plates and appliances.
5. Oil and gasoline heating and cooking devices.
6. Electrical heating and cooking devices and appliances.
7. Black galvanized and enameled ware and tin-plate household utensils.
8. Refrigerators.
9. Ice-cream freezers.
10. Washing machines.

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11. Clothes-wringers.
12. Family sewing machines.
13. Electric vacuum-cleaners.
14. Metal beds, cots, couches, bunks, and metal springs for same.
15. Boilers and radiators.
16. Baby carriages.
17. Corsets.
18. Bicycles.
19. Electric fans (including motors).
20. Builders' hardware.
21. Padlocks.
22. Stepladders.
23. Scales and balances.
24. Rat and animal traps.
25. Talking machines (including motors and accessories).
26. Talking-machine needles.
27. Watches and clocks.
28. Watch-movements and watch-cases.
29. Hand stamping and marking devices.
30. Safes and vaults.
31. Lawn-mowers.
32. Pottery.
33. Pocket-knives and similar products.
34. Linoleum.
35. Rag-felt floor-covering.
36. Sporting goods.
37. Glass bottles and glass jars.
38. Tin plate.
39. Pianos, including piano players, automatic pianos, and parts.
40. Pneumatic automobile-tires.
41. Passenger automobiles.
42. Cash-registers.

Nothing herein contained shall be construed to release any industry or manufacturer from the strict observance of the rules and regulations of the Conservation Division of the War Industries Board as applicable to such industry or manufacturer.

Dealers and Manufacturers Given Liberty on Deliveries

Dealers (wholesale and retail) in raw materials, semi-finished and finished products are hereby relieved from the obligation to give and require pledges relating to such commodities notwithstanding any provision for pledges in any order or circular heretofore issued by the Priorities Division, and notwithstanding any stipulation in any pledge that they will require pledges from those who buy from them for resale: Provided, however, Building materials and other products shall not be sold and delivered for use in connection with any non-war construction projects save those for which no permit or license is required under Priority Circular No. 21, as revised above, or those authorized by permits or licenses issued in pursuance of said circular: Provided further, Manufacturers will continue to give pledges in accordance with the terms of orders and circulars heretofore issued, and comply with all pledges heretofore or hereafter given, save that they are hereby relieved from the provisions in such pledges as require manufacturers to exact pledges from those who buy from them for resale.

Precedence Given to Needs of Shipping, of the Army and Navy, and of Reconstruction

The Priorities Division of the War Industries Board will, as far as practicable, assist industries in procuring materials, fuel, transportation, and labor to enable them to increase their operations to normal limits as rapidly as conditions may warrant. Precedence must, however, be given to stimulate and increase the production of cargo ships and supply the requirements of the Army and the Navy of the United States, as well as to provide for this Nation's proper proportion of the enormous volume of materials, equipment, and supplies as shall be required for the reconstruction and rehabilitation of the devastated territories of Europe. Precedence must also be given to such activities as will tend to stimulate the production of foods and feeds, of coal, of natural gas, of oil and its products, or textiles and clothing, and of minerals; and to provide for deferred maintenance, additions, betterments, and extensions of railroads, telegraph and telephone lines, and other public utilities, and to permit and stimulate the intensive development of inland waterways.

The War Industries Board requests, and with confidence shall expect to receive the continuance of that whole-hearted co-operation and support of the industries of this Nation which it has heretofore enjoyed, and which will make possible the success of so much of the industrial adjustment program covering the period of transition from a war to a peace basis as it is called upon to administer.

Edwin B. Parker,
Priorities Commissioner.

Approved:
Bernard M. Baruch,
Chairman War Industries Board.

Washington, November 11, 1918.

Willie, are you and Roy in any mischief out there?" "Oh, no, ma," came the reply. "We're just playing with some eggs the grocer left, to see how many times we can catch them before they break."—Boston Transcript.

"What has become of the search for the philosopher's stone?"

"The search changes with every age. Now we're looking for a tire that won't puncture.—Spokane Spokesman-Review.

Abdul Hamid attempted suicide several times. Think of a sultan of Turkey falling so low that he has no one to kill but himself.—'Columbia State.'

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Causes and Prevention of Accidents in the Metal Industries

THE U. S. Department of Labor has recently issued Bulletin No. 234 on 'The Safety Movement in the Iron and Steel Industry; 1907 to 1917', by L. W. Chaney and Hugh S. Hanna, from which the following statements are taken. A distinction is made between the 'frequency rate' of accidents, which is based on the number of accidents irrespective of their severity, and the 'severity rate', which is based on the extent of the injury and the amount of time lost by the worker.

In blast-furnaces the characteristic cause-groups are subdivisions of the general group of 'hot substances'. They are 'break-outs', 'explosions' connected with slips, and 'gas flames'. Each of these has its appropriate remedy in some form of structural improvement. Asphyxiating gas is also a serious menace in the blast-furnace and must be controlled, if at all, by better construction. A fairly steady decline is recorded for all classes of accidents. Some causes are naturally more sensitive to fluctuating industrial conditions than others, but all of them have been influenced by the efforts at prevention that have been in progress during the period under discussion.

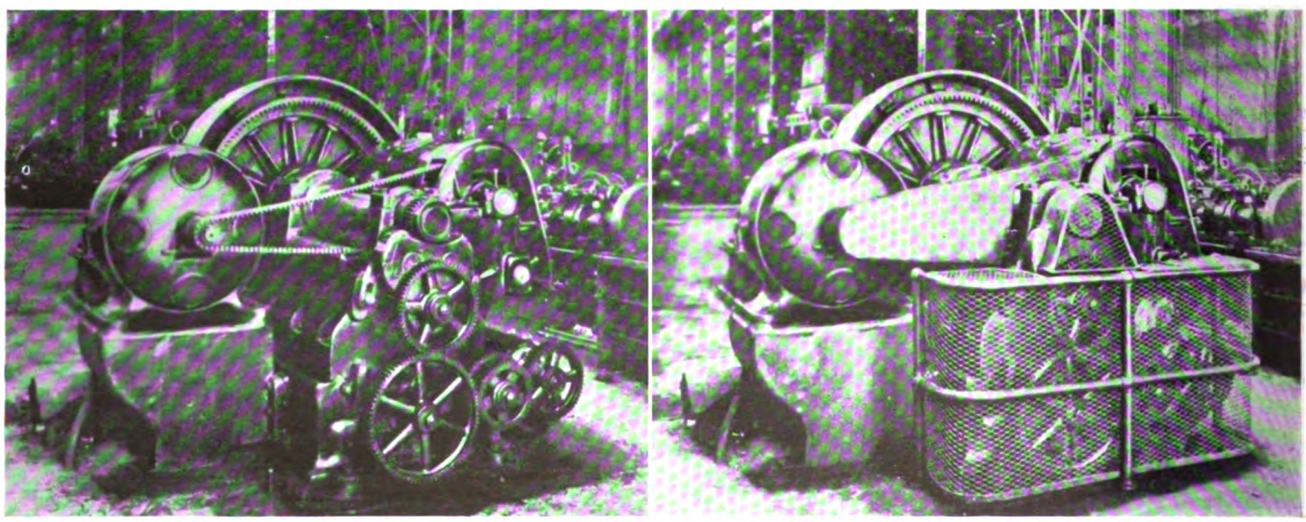
Much light is shed upon the proper point for applying effort at accident control by considering the relation of special occupations to the causes. For example, it appears that injury from hot substances is much more common among the members of the cast-house crew than among other blast-furnace workers, while asphyxia is distributed almost uniformly. Such facts indicate quite definitely the limitations and particular direction of special effort. Steel works and foundries present in a modified form the hazard of 'hot substances'.

The bessemer department has two items of procedure peculiar to itself, which require some special efforts at control. When the blast is turned into the converter many molten particles are thrown out. Ordinarily these are not of a size to be particularly dangerous, but at times they may cause serious burns. Screens protecting the workers are now frequently used with good effect, but more important probably is the adoption of a plan of work that does not require the men to expose themselves as much as formerly. The second item is the throwing of heavy masses of scrap into the converters. When this was done directly, the men were exposed to great heat. Often the masses of scrap would fall to the pit-floor, endangering any one working there. In the best plants this is now done behind water-cooled screens and through chutes that make a fall to the floor below nearly impossible.

In heavy rolling-mills the element of hazard which appears to be most difficult to control is 'hot substances'. In all other particulars there is marked improvement. This control has been largely due to the introduction of improved machinery both in the apparatus used directly in the rolling process and in such accessory apparatus as cranes.

In tube-mills there is a combination of mill processes with machine-shop conditions, making the problem of control quite different. These mills have scored a remarkable success in the reduction of accident frequency, while the severity rate, fairly low at the beginning, has not been reduced so much.

The control of accident causes in mechanical and fabricating operations must in the nature of the case be



UNGUARDED AND GUARDED LATHES

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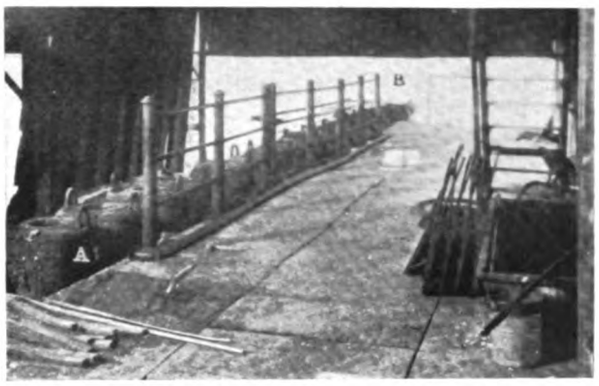
largely a matter of personal care. So many of the operations are of a personal and manual character that the individual worker's attitude must be a material factor. Indeed, whenever an effort that succeeds in interesting the men of such departments is undertaken, the frequency of accident at once begins to decline.

The yard department has its chief danger in the operation of power-vehicles. In the plants studied, the greater number of cases arise from coupling and uncoupling cars. The obvious remedy is the introduction of automatic couplers. The severity rate receives its greatest contribution from the men being run down by moving locomotives and cars. Improvement in such matters as grade crossings, clearances, permanent signal apparatus, and safety appliances on cars and locomotives is the main factor in reducing such hazards.

The human factor has probably been charged with



INGOT-MOLDS WITH RAILING FOR PROTECTION OF UNCAPPERS

much more than its fair share of importance in causing accidents. It rarely gives rise to serious injury without there being some factor of physical condition that could be remedied.

The accident-rates of the inexperienced worker are uniformly high. The influence of inexperience is most clearly apparent in the study of 'labor recruiting'. In times of increasing industrial activity new men are employed in larger numbers. Among them there will be, except in unusual circumstances, a proportion of inexperienced men. Even if familiar with the industry they will be new to the particular conditions of the plant into which they come. This factor of labor recruiting influences the accident-frequency rate. These rates follow the recruiting with remarkable exactness, rising when recruiting rises and falling when it falls except in special cases in which it is possible to identify other factors tending to nullify the natural effect of labor recruiting.

Workers in different age-groups are rarely employed in tasks of sufficient similarity to admit satisfactory comparison in the matter of hazard. That is, the differences observed are due to the differences in work done rather than to any influence of age as such. In steel works the decades 20 to 29 years and 30 to 39 years are very closely similar in the work done. The younger group has a higher accident rate. This can hardly be due to any other cause than the relative inexperience of the younger group.

Of all inexperienced men the one suffering the most serious handicap is the one who is both new to his task and also is unable to communicate freely with the man to whom he is responsible. Study of this condition shows that the accident rates of such workers are higher than of those familiar with the language. That this is not due to some racial peculiarity is indicated by the fact that the English-speaking foreign-born have rates scarcely higher than the American-born under similar conditions.

In all heavy employments there is a pronounced tendency to higher accident rates at night. The explanation lies along two lines: imperfect lighting, and an unsatisfactory condition of the worker due to various causes. The experience of some plants indicates that this tendency can be controlled.

There is no measurable difference between the accident-frequency rates of the married and the unmarried of the same age-groups.

Safety men are practically unanimous in the conviction that the use of alcohol is an important factor in causing accidents. In view of this attitude an effort was made in the course of this study to determine the basis of their view and to apply to it all possible tests. The conclusion was reached that it is impossible to secure the same kind of evidence that may be obtained regarding physical causes. When a man is run down by a car that fact can be determined and recorded. It is a different matter to determine whether alcohol had much, little, or nothing to do with his failure to escape from his dangerous position.

The most interesting question that can be asked regarding accident occurrence is 'Can serious accidents be eliminated?' The usual opinion is that it is an entirely futile question, since it is a matter of common knowledge that they cannot be. The results of this study discredit this 'common knowledge' at several points. For example, when causes of accident are followed closely from year to year it is found that certain causes contributing but a small number of cases are responsible for large losses of time. The decreasing time loss from year to year shown in these causes has been due to improved physical conditions. This is noticeable for hot metal 'break-outs' in blast-furnaces. A steady increase in strength of construction in the furnaces finally brought 'break-outs' to an end. The result was a large reduction in the severity rate. On the other hand, causes depending largely on personal care, such as 'handling tools', while showing great reduction in number, contributed little to the reduction of severity, part of which must be attributed to better tools. If, as appears to be the case, serious accidents are reduced mainly by the process of physical improvement due to 'engineering revision', no limit can be set to this reduction. Human carefulness probably cannot be speedily perfected, but physical conditions possibly can be, at least, to a point making serious accident a rare occurrence.

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The Employment Manager: A New Factor in Industrial Relationships

By EDWARD D. JONES

THE general executive is a correlator. He is a balancer of claim against claim. His business is to define the general aim and to harmonize all lesser or intermediate achievements with it. The line executive in war determines where a battery shall go and what it shall do, but he depends upon staff men to breed a reliable artillery-horse, to design convenient gun-carriages, or to prepare service-tables for sighting guns. In industry, as far as mechanical equipment is concerned, the function of staff departments is already seen clearly.

The work of the general executive must be supplemented by that of specialized staff departments.

The general executive desires a plant; but he depends upon the architest and the engineer to design it. He desires a product; but he organizes a designing and drafting department to control the dimensions of parts. This principle of staff service is being applied in the field of human administration. General executives demand well-chosen men, men physically examined and pronounced safe for the work they are to do, men that are properly paid, and men that are so handled as to become permanent, contented, and loyal co-operators in the general plans of the enterprize.

The distinction just drawn between line and staff is a special case of the application of the principle of the division of labor to administration. This principle is being applied at a lower level in the hierarchy of industrial administration. One of the merits of the movement known as 'Scientific Management' was that it called attention to the absurdly wide range of functions that the average foreman has to perform. This officer, until a short while ago, was attempting, in most establishments, to hire men, set their wages, and discharge them, to find work for men and machines from hour to hour, to recommend equipment for the shop and keep the equipment in repair, to give an off-hand opinion as to when future work would be completed and what it would cost, to maintain a stock of raw materials, to preserve discipline, and to furnish the office with such records as were required. The degree of efficiency attained with such supervision was low.

The average foreman has an absurdly wide range of functions to perform.

The remedy is functionalization. This means that groups of related functions should be put in charge of service departments, such as the stock-room, the planning-room, the tool-room, the designing department, the engineer in charge of repairs, and the estimates department. In conformity with this idea, there has come into existence, in thousands of businesses, a department in charge of the supervision of most of the relations between employer and employee. In this way the foreman is relieved. He no longer is a 'bouncer'. He has not the easy device of covering his own incompetence by firing a man; but must suggest a transfer, which may show his employee able to give satisfaction in another shop where the foremanship is different. He gets a more even and dependable run of workmen from the employment department than he could obtain for himself.

Groups of related functions should be put in charge of special departments, including an employment-management department.

Vocational guidance is a sister movement to vocational education. It has shown the necessity of analyzing industrial tasks. This experience of the schools, in the guidance of youth, has caused us suddenly to realize that, for most communities, the only vocational counselor yet available is the man that does the hiring in the factory. Hiring, then, takes on a new significance. It is no longer giving out jobs; it is, or ought to be, vocational guidance. For this important function are needed skill and specialized experience, and a high ideal of responsibility to the person employed.

Hiring is no longer giving out jobs, it becomes vocational guidance.

The school records show that about one-half of the children leave school by the end of the sixth grade. They also show that less than three-fourths of the children are in school as much as three-fourths of the time. This is mainly because the vocational ambitions of the child, and of the parents for the child, are not properly utilized by the schools as a source of interest and energy. The result is that the employer receives workers that require technical training, if they are to be lifted out of 'blind-alley' occupations, and made valuable employees. This raw human material is so ignorant of the significance of the crafts, that it is preyed upon constantly by monotony and hostility of mind, produced by lack of

The employer must often provide industrial training and even general education to prevent employees falling into 'blind-alley' jobs.

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understanding of the significance of the work performed. The employer, therefore, must often provide industrial training, and even general education. Such activity demands the general supervision of the employment manager.

Psychological investigations make it possible to select from the applicants for jobs at a factory office those persons who are adults in physical development, but who still have the minds of children. It identifies the self-centred paranoiacs, also those bright and optimistic persons that because of temperamental instability are certain to endure for a short time only, or to become trouble-makers. As such persons may comprise from 5 to 15% of all applicants, the importance of careful examination is obvious. This identification is not for the purpose of refusing them work, but to give them work that is within their powers, and to provide them with a supervision that is more intimate, constant, and forbearing than normal persons require. Such investigations are part of the work of the employment manager.

Setting a wage-rate is perhaps the most vital matter in the relation of employer to employee. Wages can never be made wholly satisfactory until greater definiteness is attained in measuring the basic factors involved, namely, the worker's talent, the quality and quantity of effort required by the task, and the working conditions.

Planning a combination of hourly wage-rates and production bonuses requires skill and study on the part of the employment manager.

Where low rates of pay are concerned, it is essential to obtain the local cost of living, by first-hand inquiries. Where excess performance is required, it becomes a problem for the expert to say what excess above standard wages is required. The ideal wage-system is that of the man in business for himself. For him, reward varies in accord with performance. The endeavor of executives to approximate this system has led to many kinds of production bonuses. Where these bonuses are sufficiently localized in an individual shop, and pertain to a sufficiently definite and measurable aspect of performance, and where they are founded properly upon an hourly wage-rate and a standard performance, they have given satisfaction. To plan such bonuses in strict accord with the conditions of the individual business, the employer needs the services of a competent department.

The sense of responsibility felt by the modern employer for his men has led to a movement to cut down the large toll of bruises, burns, infections, mutilations, and deaths in industry. This impulse has been supplemented by workmen's compensation laws, which enforce responsibility upon those employers who do not voluntarily assume it. The study of accidents shows that they result from bad management in the shop, from equipment allowed to fall below standard condition, from lack of training, from labor turn-over, from lack of physical examinations, and lack of job analysis. Above all, they are caused by the absence of a judicious attitude of mind among employees. The employment manager must therefore supplement the engineer in this work.

Great advance has been made in medical science in recent decades. This advance has shown the intimate relation between good water, ventilation, digestible food, regularity of habits, and health in the home on the one hand, and accident rates, fatigue, irregularity in attendance at work, antagonism of mind, and strikes on the other. The interdependence of these factors accounts for the profitableness of the health work that has been undertaken by progressive employers.

There is a wide field of activity, having to do with the efficiency of the worker, and including such matters as thrift, legal aid, insurance, pensions, housing, and recreation, in which the employer will desire that as large a portion of the initiative may come from his employees as possible. The employment manager's task is to guide these activities into fruitful channels in as natural a manner as possible.

The ideals of truth and service have, for many years, been prominent in the world of advertising and selling. Only short-sighted persons still believe that to make a sale terminates a business relation. It is much more in harmony with the best practice to say that a sale begins a mutually profitable relation. If this conception of a service relation be carried into the interpretation of the labor contract, it will be seen that, in reality, an employer 'sells' a job to the employee. He 'sells him', or satisfies him, as to wages, working conditions, the task to be done, and the policies of labor management in general. Then his problem is to keep him 'sold'. But it should not be a mere job that is sold. A permanent relationship should be entered into—a relation of mutual aid and protection. To quote Henry Ford, "It is not a living but a life we are trying to provide for our workmen." This ideal of service has led American business men to venture beyond what were once considered to be the boundaries of strict business. The surprising thing about such ventures has been their profitableness.

The employer 'sells' a job to the employee, satisfying him as to wages, working conditions, and work to be done. Then his problem is to keep him 'sold'.

NOTE. Emergency War Courses in Employment Management, for men and women, have been conducted by the Government at Boston, where Harvard, Boston University, and the Massachusetts Institute of Technology are co-operating; at New York through the Bureau of Municipal Research; at the University of Rochester; at Pittsburgh, Carnegie Institute and University of Pittsburgh co-operating; at the University of California; and at the University of Washington. Courses at the University of Cincinnati and Chicago are being arranged. Employers are invited to suggest men or women in their employ for these courses, which run from six weeks to two months. There are no tuition fees. Employers or individual applicants will be furnished complete information regarding the courses and entrance requirements by addressing Captain Boyd Fisher, Employment Management Division, War Industries Board, 717 Thirteenth St., N. W., Washington, D. C.

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Special Alloy-Steels in Use on the Pacific Coast

By H. G. BAIN

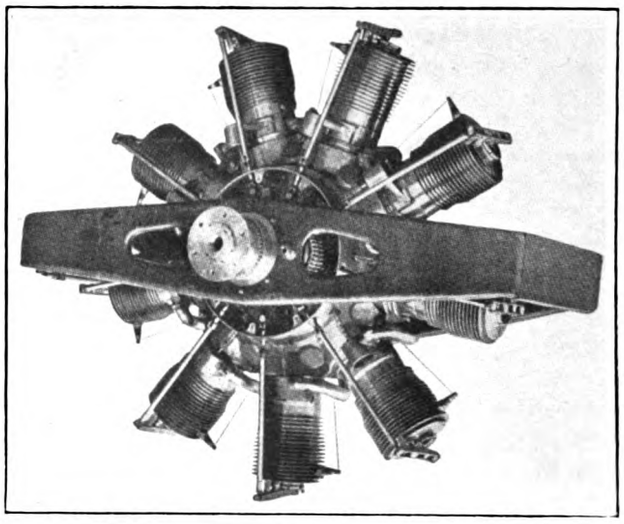
THE use of steels of special analysis on the Pacific Coast has shown a great increase during recent years on account of the extensive developments that have been made in their manufacture and field of usefulness. Among the most common of the so-called alloy-steels are 3½% nickel-steel and chrome-nickel steel.

Steel with 3½% nickel has found many valuable applications in Pacific Coast industries for such articles as tumbler-shafts on gold-dredges, shafts and axles on logging locomotives, which are called upon to withstand severe shock and strain, and for many parts of trucks and tractors that have to meet the severe conditions of Western service. For most uses, this steel is furnished with a carbon content between 0.30 and 0.40%. A large amount of nickel steel containing 0.15 to 0.25% carbon is also consumed annually for casehardened gears and other parts. The use of nickel increases the toughness of the steel. With a carbon content between 0.30 and 0.40%, which increases the tensile strength, 3½% nickel-steel is much superior to ordinary soft steel for parts required to withstand shock and strain.

Chrome-nickel steel, containing about 0.75% chrome and 3% nickel, is superior to 3½% nickel-steel for many parts required to withstand extra hard service and where light weight is required. The addition of chrome increases the hardness of the steel, which makes it possible to obtain a high tensile strength without reducing the toughness as much as would be the case with a straight nickel-steel of the same ultimate strength. This material is used extensively for automobile parts. In addition to the type analysis, mentioned above, a chrome-nickel steel is also used containing about 0.50% chrome and about 1.50% nickel. This steel, while not as rich in alloy substances as the other, has proved satisfactory, when properly heat-treated, for automobile axles, bolts, etc., the use depending upon carbon content.

Alloy-steels are more susceptible to changes in temperature than ordinary steel. Greater care must therefore be exercised in their forging and subsequent treatment. Slow and thorough heating is necessary and the parts should be annealed after forging to put the steel in proper physical condition. For large sections, such as a 3½% nickel-steel logging-locomotive shaft or axle, annealing after forging without further treatment has generally been found to be satisfactory. In this condition the part will be very tough, which is essential for this class of service. The facilities on the Pacific Coast are in most cases inadequate for more elaborate treatment of large forgings. For many parts, however, such as automobile shafts, axles, and gears, where light weight is essential, oil tempering and annealing is required, if the full value of the alloys in the steel is to be secured and the best of results obtained. This is especially important for chrome-nickel steel, which is capable of developing great strength when properly treated. This treatment usually consists of heating thoroughly to slightly above the critical temperature (1400° to 1425° F., or full cherry red, for a 0.30 to 0.40% carbon-nickel or chrome-nickel steel) and quenching in oil. The part is then re-heated to the temperature that will anneal it properly for the purpose required.

For an automobile axle, using the steels mentioned, a temperature of 1100° to 1200° F. should be maintained for about one hour, which treatment will ensure uniform heating throughout and leave the steel soft enough to be machined without difficulty. When in this condition the scleroscopic hardness should be about 40. The proper drawing temperature for an oil-hardened gear of this class of steel is about 400° F. Tempering should be done in an oil bath and the temperature held for about one hour. To caseharden parts made of 0.15 to 0.25% carbon nickel or chrome-nickel steel, they should be packed in the carburizing mixture and heated to 1600° to 1650° F., held at that temperature for a sufficiently long time to give the desired case, and then cooled in the box. They should then be re-heated to about 1425° F., kept hot until soaked through, and quenched in oil. Drawing at 300° to 400° F. is then advisable to relieve strains caused by hardening. The value of alloy-steels, properly treated, is becoming increasingly evident. New uses are found for them as more general knowledge of their treatment is acquired.



AEROPLANE ENGINE OF ALLOY-STEEL

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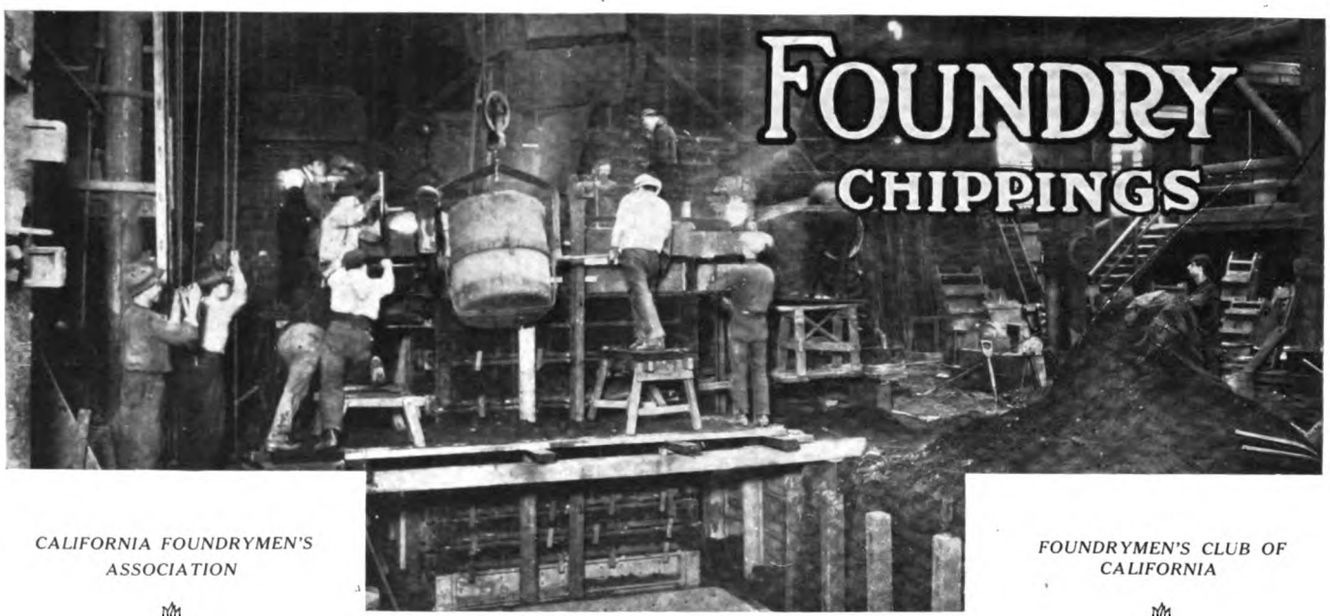

CALIFORNIA FOUNDRYMEN'S ASSOCIATION

FOUNDRYMEN'S CLUB OF CALIFORNIA

D. GUILD, Jr., Editor
Phoenix Iron Works, Oakland

Impressions From the American Foundrymen's Association Convention at Milwaukee, October 7 to 11, 1918

By C. M. HENDERSON

The November issue of 'The Foundry' has covered the subject of the convention with a most thorough and detailed statement of all its transactions, omitting only some technical details that the Government requested be not given general publicity at this time. I presume all foundrymen in the West have carefully read this account and possibly some have conceived the idea that they have gained thereby the greater part of the benefit to be derived, without sparing the time or expense of attending such gatherings.

California's delegation comprised about ten men, a decidedly small representation proportionately, possibly for the reason that we have not yet learned to appreciate or to know the benefits to be derived from collective action of this kind. It has been said that the greatest good to be derived from a college education is the opportunity to compare one's self with one's fellowmen. Attendance at conventions of this kind probably does more good in the foregoing respect, than can be derived from any particular ideas gleaned or new methods learned, besides producing the result unconsciously.

The first impression obtained by a Californian foundryman when he makes himself known, is that he is a long ways from home, and the next one is that he is right at home, and the more he sees of foundries and foundrymen the more firmly convinced he becomes that the great expanse of barren country that separates the West and East has but little effect on the industry, aside from the subject of freight rates.

Comparative labor condition is a subject of its own, but suffice it to say that the Eastern foundryman doesn't expect a man to deliver as many castings by using a horse and cart as he can with a modern high-speed motor truck so he provides the latter instead of beating the horse.

The past twenty years have done a great deal toward bringing the whole country under one roof. They have accepted our 'two-bits' and forced us to accept their 'pennies'. We will soon have to accept orders for castings of intricate design and difficult specification, for this is the trend of the iron industry, and it is moving this way too. We must soon learn to specialize on some particular lines of work or at least general character of work if we don't want to lose money on everything. More money is being made in Eastern foundries, at closer margins, through specializing than by any other course of effort.

The Milwaukee Convention probably brought together the greatest aggregation of foundrymen in the world's history, and while their interests were centred to a man on the sole object of speedily winning the War, plenty of time and opportunity was afforded for shop visitation and sight seeing. The hospitable reception tendered us all by the Milwaukee manufacturers has left a lasting and pleasant impression of their fine city and people.

The changed conditions resulting from the War and its administration have brought about conditions on the Pacific Coast that seemingly would warrant a revival of a project advanced last year. A Pacific Coast convention of the foundry branch of the metal trades would

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be especially desirable. For the sake of the foundry and the manufacturing interests of the Coast let us get together and keep together in the work that so vitally affects our common interests.

The Apprentice Question

"In a recent arbitration to fix the scale of wages to be paid the members of a certain labor union, the union representatives asked that the number of apprentices should be reduced to one to every twenty journeymen employed, and the arbitrator finally fixed the number at one to every fifteen. In this trade the minimum term of apprenticeship is five years.

"What do these figures mean? It will take 75 years to replace 15 mechanics with apprentices who have served their time in such shop. In imposing these terms the labor union acts as if some of its full-fledged members were expected to live and be able to work 75 years, for it will take that long to replace the last of the original staff with an apprentice trained in the shop. If such a system were universally applied, the number of skilled mechanics would dwindle to the vanishing point. The labor unions ask an impossibility when they demand such terms. It is true that the employers submitted and the union claims to have won, but it is cutting its own throat.

"Instead of developing a sufficient number of skilled journeymen within its own ranks by permitting the training of the proper proportion of apprentices, this union opens its doors to half-trained men that have picked up some of the rudiments of their trade in open shops. The unions have to admit these poorly trained men to membership to prevent them from cutting the wage scale and to keep employers from declaring open shops because they cannot procure sufficient skilled workmen within the union ranks. Instead of serving an apprenticeship of five years of learning the trade thoroughly, a smart boy goes to an open shop and picks up some branch of the trade in two years. Then he gets wages almost equal to those of full-fledged journeymen and does some part of the work satisfactorily. He becomes a thorn in the flesh of the union, and the union admits him as a regular journeyman. Most of such journeymen know only part of their trade and seldom learn the rest.

"The result is that America is suffering for lack of skilled mechanics, and few of the men can qualify for positions as foremen and superintendents. This is bad for the men, for the unions, and the employers. Boys say, why should I work for five years as an apprentice in a union shop when I can 'scab' it for two years and get full pay and a union card? In some unions half the members learned the part of the trade that they know in this way in open shops."—'The American Metal and Trade Review'.

Speaking about apprentices it might be well to call the attention of employers, and also the journeymen, in shops around the Bay district, to the unrest that exists among the apprentices. Apprentices have in many cases quit their jobs, and have loafed. Others have acted in an unruly and 'don't give a damn' spirit so as to get fired. They then rustled around and went to work in other shops at increased wages.

It may be said in justice to Association shops that they are not hiring these drifters, but it is charged that the Navy Yard at Mare Island accepts them without question. It is too bad that a Government plant should take these boys, thereby causing discord and trouble in other shops. The Union representatives in the Bay district are trying to do the right thing in this matter. In fact, in some instances, boys who have been known to be running from shop to shop have been severely reprimanded and sent back to the shops where they began to learn their trade. Let us do all that we can to discourage the 'itching-foot' apprentice-boy, for he surely is a menace to the future supply of able mechanics.

Foundry Birds

There are some birds that are known to you all
They come around shops and get by on their gall.
Of feathers and bills they are quite a bit shy
But they're there with the nerve in abundant supply.

The first one is the bird who brings
A busted pattern tied with strings
A molder couldn't get it right
Without the aid of second sight.

The second is the promise guy.
"I'll take a big bunch by and by";
But when you've turned out three or four,
You'll find it's bull. He needs no more.

The third bird is the one who pays
His bills in far dim distant days.
Oh, Lordy how I'd love to shoot
A quart of iron down his boot.

These and lots more that we know, let's collect 'em
Right now to the Down and Out Club, we'll elect 'em
And consign them with care to that far away shore
Where they'll roast in a cupola. Long may she roar.

HARRY HARGRAVE, foreman of the Bethlehem pattern-shop, was wont in former days to pay a daily visit to Dick Schilling at the iron foundry. He did not appear for three days lately, so Schilling thought he had 'flu' the coop. Investigation disclosed that Harry had four of Uncle Sam's yeomanettes in his office checking up the year's work. Nuf Ced.

SMYTHE has a peculiar falsetto voice, hasn't he?
Yes. I suppose it is because of his false set o' teeth.

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A Few Hints on the Cupola

By John Hedley

AFTER listening to the very clever and interesting talks of R. Schilling on the construction of the cupola, and by W. Lauten on the manipulation of the same, and noting also the great interest in those talks, it appeared to me that it would not be amiss to add a few words myself on this very important subject. These remarks, I wish it to be understood, are not for such as are here in this room, who are old at the game and are past masters as cupola experts, but are intended for younger foremen or leading men; the coming men who have not yet had an opportunity to study the workings of a cupola, and to those who study these combined remarks, they might be the means of saving them much trouble and mortification in the future.

IMPORTANCE OF CUPOLA

In the first place there is no one thing in the foundry that has so much to do with the well or ill-doing of a foundry as the cupola; for, no matter how good the molds and cores are, or how careful the molder may be, it is of no avail, without suitable iron. There used to be considerable superstition with regard to the cupola. Some days it would do well, some days poorly, but common sense tells us that if things went well one day, they would go well every day if the same methods were pursued. Moreover, very often the care of the cupola is in the hands of an incompetent or ignorant man, who never can rise to the requirements of the situation, so it is very vital that the foreman at all times should be ready with the word of good advice and enable such a melter to get by with his task, also giving the foreman a sense or feeling of confidence and security.

Although melting is done pretty much on the same lines in all places, every shop must run the cupola to suit its own requirements. The rules are very simple and easily acquired, also there are quite a number of different ways of getting good results out of a cupola, always bearing in mind that melting is done in the first instance with the idea of making castings, good castings, and not to see how little coke can be used, or what other like economies can be obtained. The foreman's task is to do good work, and a trifle more coke is cheaper than making molds and cores.

CRUDITY OF CUPOLA

The cupola is a very crude and inefficient tool, but modern science does not appear to bring forth anything new or improved along those lines. I am told it is not above 30% efficient, but let it be as poor as it may, it is up to us to do the best we can with such tools and knowledge as we may possess. It might be mentioned here that in 1854, Mr. Ireland invented the double tuyeres, also the centre blast tuyere, but afterward rejected the latter, so that in sixty years very little change has been made, except in building higher cupolas. But certainly there is quite an advance in a more general knowledge of cupola practice. Plenty of practical people believe today that a plain cylindrical cupola with a single row of tuyeres is as good as any.

CHARGING THE CUPOLA

As the first step in charging a cupola, and to ensure that a good start is made, a proper bed of coke is necessary. This is best ascertained by use of a measuring-pole from the top of the bed to the charging-door. This is apt to change a little from time to time as a result of different qualities of coke. Coke with a hard strong structure will do with a lower bed than a soft mushy coke, so there could be a difference in a bed of 18 in. to even 30 in. above the tuyeres. A little experience and observation will soon teach the student how high it should be, since, if everything is right, the first melted iron will show at the spout in eight or nine minutes after the blast is on. If the bed is too high, it will be longer melting, depending on the excess of coke. (Having once found such a point, make no change till next charge of coke takes place.) If the coke-bed is not high enough, the iron will melt quicker but too dull, if too high, it

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will be too long coming down but will be hot all right, unless very much in excess, which causes poor melting. A proper depth of bed is very important, as the melted iron by dropping through melting-zone absorbs enough heat to make it fit for the molder's use.

IMPORTANCE OF THE COKE-BED

The life-giving qualities of a cupola are immediately above the tuyeres, so a sufficient depth of coke must be maintained at all times through heat. In all succeeding charges this rule must be followed rigidly, always observing the quality of iron at the spout, using a little more coke when the iron comes dull, and less when over-hot, not forgetting that a large excess of coke will give almost as poor results as too little. In my opinion, the iron should be put on as soon as the bed burns clear and the blast put on as soon as possible after charging is completed.

WEIGHT OF CHARGES

As a clue to charging, a cupola of 40 in. diam. will act very well with 2000-lb. charges, which can be divided, 1000 lb. of pig and scrap, and then 1000 lb. more of pig and scrap, making 2000 lb. for each charge. Then put on a charge of coke and follow by iron as before until completed. After the first charge of iron, a charge of coke of 200 lb. or less will raise the bed about 13 in. and will melt the next charge of iron of 2000 lb., which, with average pig and scrap, will measure 23 in. deep. This kind of charging will serve for 10 to 20 tons as may be required. In a 30-in. cupola 100 lb. of coke will raise the bed 9 in. and melt 1000 lb. of each charge. To explain why it is set at 2000 lb. per charge for a 40 in. diam. cupola; experience has shown that under these conditions the melting is continuous with no check or change in temperature of the iron, which would be likely to be the case if the charges were made too heavy for a cupola of this diameter. The splitting of the charge of iron is with the idea of getting a good mixture, which can also be helped by tapping a good quantity at once and endeavoring as far as possible to get 1000 to 1500 lb. at each tap. There will then be no question of hard and soft iron at one time from the cupola.

MELTING OF IRON

A cupola is one of the crudest and most simple tools that it is possible to imagine, essentially a shell of iron lined with fire-brick, but when charged properly, the fire lit, and the blast put on, its character is changed. To me for the time being it becomes alive. The wonderful transformation in fifteen or twenty minutes from that coarse ragged pig-iron and rusty scrap to the beautiful sparkling fluid fit for a thousand purposes, is as full of interest at the present time as when I first saw it. This subject has always had a fascination for me, and it never gets stale or wearisome to watch the coke and iron put into its hungry maw with an occasional digestive tablet in the shape of a little limestone. It is hard to say how much coke and iron can be put in before the cupola gets sick and tired.

When melting, if a reddish-blue flame appears at the charging-door, all is well, but, if it turns yellow, the charge has hung somewhere, so shake it loose as soon as possible and let it drop on the coke-bed.

RATIO OF COKE FOR MELTING

Cupolas are all run along the same general lines. Every shop has its own needs and its own requirements in shape, size, blowers, and pipes, which have to be taken into consideration, neither can all shops melt at the same ratio. The shop that melts large heats and has most of the heat tapped into large ladles could perhaps manage with 1 lb. of coke to 10 lb. of iron, or better. On the other hand, a place doing light work and light heats that must have very hot iron would perhaps be doing as good work with a ratio of 1 lb. of coke to 6 lb. of iron. The sizes of pig and scrap have a bearing on ratio and speed of melting, not forgetting that iron must always be melted hot to allow dirt to be set free, even if one waits to cool it off afterward.

At present there are those who favor a central column of coke. I am trying experiments along these lines, and would say at this time that the late Thomas Morton, my old partner, used to advocate the central or pyramidal coke-charge as much as thirty years ago, but to the best of my recollection had no followers.

UPKEEP OF A CUPOLA

The upkeep of a cupola is a very important part of the same. A newly lined one will give out at the melting-zone in three or four days or less, so some safe way of keeping that in order must be adopted. The rapid destruction takes place from a point immediately above the tuyeres to perhaps 24 in. above them. Some melters use clay and broken or split fire-bricks. These are likely to slip down and bridge. For our own practice, the melting-zone is left to go as long as it will. Then new bricks are built in as fast as necessary, using very little clay, or none at all, packing the bricks as close as possible to prevent the fire acting on their sides, as the clay melts out. This will be found to be a very satisfactory way of keeping the melting-zone in good order, and doing clean work. If clay and split bricks or pieces are used, they are likely to slough away and cause trouble by bridging. For a long heat it will be found good practice to put a fire-brick under the tapping-hole.

BLAST

Blast-pressure has little or no meaning, as it is volume and not pressure that gives results. In my own experience a change was made that reduced the blast-pressure from 12 oz. to less than 5 oz. and gave much better results.

SPEED OF MELTING

There is, I suppose, a limit to the speed with which iron can be melted in a 40-in. cupola, but in my experience I have not found it. Our normal melting-rate is 9000 lb. per hour, but when filling large ladles we melt 12,500 lb. per hour. This increased speed, however, is more destructive to the lining. Good melting can be done with a light blast, but it naturally will be slow.

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The Iron and Steel Situation*

CALIFORNIA is peculiarly situated as regards iron and steel because of the distance from the sources of supply. Before the War we were getting pig-iron from all parts of the world. English, Belgian, Chinese, and Indian pig were used, but, because of the high railway freight-rates, United States pig was beyond our reach. The War not only caused a demand for iron and steel products hitherto unknown, but it also cut off our usual supply. In spite of this, the call for ships and engines was accepted in California. With the same spirit that re-built San Francisco after the fire, we have built more ships and have built them faster than any other part of the United States. And this in spite of the fact that we have no local production of pig or coke. We have accomplished a commercial miracle and it is recognized as such by the big men of the East.

It was no easy task that the Pacific Coast accomplished. We soon exhausted our own supply of scrap and were compelled to haul pig from the East and scrap from Louisiana, the Middle West, and Alaska, all under difficult conditions. With the co-operation of the whole community we have turned out ships, aeroplane and marine engines, and tanks in a way to astonish the world. Although there is such as shortage of pig in the East that the foundries and mills are compelled to use 50% of scrap in place of the 10% maximum formerly the custom there, yet the efficiency of the Coast is conceded to be so great that we are permitted by the Government to draw scrap from points as far east as the Mississippi and we will continue to do so. Practically no scrap from west of the Mississippi is going East.

On the Pacific Coast the iron problem is largely a foundry question. The way the foundrymen have handled it is truly remarkable. Many little foundries expanded enormously to take care of the increased demands upon them. How they were financed is hard to say, but questions of credit were ignored in a characteristically Californian way, at any rate the foundries got the iron and furthermore they paid for it.

The iron and steel industry will not suffer because of the withdrawal of war orders. The War Industries Board will make gradual changes in the priorities list so as to permit return to peace-time operations as the war demands cease. The demand of the normal industries will be supplied just as soon as the material is available.

That there will be plenty of business for the iron and steel industries is beyond question. Stocks of all kinds of hardware and in fact of all metal peace-time supplies are extremely low, so low that there will be a great demand for replacements. The shortage of iron for peace-time requirements while the War lasted can be judged from the fact that several short railway lines were torn up so that the steel and iron could be used for war manufactures.

The problem of supply on the Pacific Coast will never be solved until a great steel industry is established here. The only thing standing in the way of the building of blast-furnaces, open-hearth plants, plate-mills, galvanizing plants, and tin-plate mills is the high cost of materials. Coke is now known to be available; the ore supplies of the Pacific Coast are enormous and of excellent quality, and furthermore the demand is sufficient to justify the investment. There is no question in the minds of the men in the East who are in a position to know, that pig-iron, steel, plates, and tinned and galvanized sheets will ultimately be produced here, even enough for export.

Our export trade depends upon the conservation of iron and steel and upon the development of a local supply. Iron is king, not only our trade but civilization itself depends upon it. It is safe to say that without the aid of this country's iron resources the terrible War that has now been concluded would not have been won.

*Abstract of address by Emory E. Smith, Pacific Coast commissioner of scrap iron and steel, delivered before the Purchasing Agents' Association of San Francisco, November 21, 1918.

Book of a Thousand Excuses for All Persons Connected With the Foundry Trade

CHAPTER X

Excuses of the Machine-Shop Boss for Non-Delivery of a Job

The machine-shop boss is surely a past master in the art of 'passing the buck'. When it comes to turning out excuses the foundryman is an innocent child compared with the machine-shop boss. To pass the blame to the foundry for all delays is his especial delight. Even though the pattern is still in the pattern-shop, the customer is informed that the casting was lost in the foundry. He explains all about how the molder on the job drank an excess of old whiskey to avoid the 'flu' and that the good old rage went to his head instead of his feet. He tells of how the molder put the core in upside-down, and the iron didn't know on which side of the mold to stay. This naturally caused a serious commotion in the mold and the casting was lost.

On another occasion the machine-shop boss fell over against the drive-pulleys on the planer breaking them into many pieces. He stuck the broken pulleys together with glue and tied a piece of old belting around to allow for finish. As the belting was not quite thick enough he glued some cardboard on top of the belting. This dandy pattern he rushed over to the foundry at 3 p.m. to get 'two off today'. The boys got busy and rammed them

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up in a hurry, but, as they were wearing their 'flu' masks, they did not notice that the pattern had pulled most of the sand out of the flask. Next morning the castings looked like a cross between a bad run-out and a drop. Having been poured with the last tap-out of the cupola the iron was somewhat 'glassified'. After seven days of machine-work, the machine boss decided to throw the castings in the scrap and have two new ones cast. This time he brought the patterns at 3:15 p.m. to be cast that same day. But the foundryman refused to get busy.

So you see, the foundryman received credit for making rotten castings, and also for being too stubborn and unwilling to help out in an emergency. All this time the foundry was receiving the blame for the planer breakdown.

If you have a job in the machine-shop and the boss sees you coming he immediately rushes a man over to the job in order to make you believe that he has been working on the job right along. If you seem dissatisfied with the progress made, you are informed that the blamed castings were as hard as glass. Should you go away satisfied, you are immediately charged with all the time that has passed since your previous visit.

A machinist fell asleep at his lathe a few days ago and the machine kept on running and turned the whole top of the lathe off. The boss charged the lathe up to the job claiming that the loss was caused by a blowhole in the casting.

How old St. Peter will size up these machine-shop guys remains to be seen. We are quite sure that there will be a shortage of machinists 'There' unless they mend their ways. Let us hope for the best.

Our next chapter will be "Pattern-makers excuses for non-delivery of patterns on time". Butchers of wood send in your excuses. C.J.P.X.Y.Z.

Trade Notes

EVERY pill has its sugar coating excepting the Macy Award.

SAY, have you seen some of the scrap dealers with their masks on?

WHY wouldn't it be a good time to start 'The Public Ownership of Foundries'?

WHEN a feller needs a friend: Trying to run a foundry according to an agreement.

QUOTATIONS nowadays specify deliveries in terms of foundry days instead of calendar days.

WELL, we all celebrated, and it was worth paying full time for half a day's work the day after!

A STOCKTON foundry had just put in an eight and one-half mouse-power motor—Gee Whillikens.

BUTTON up your pockets, boys, did you see that notice of a meeting of purchasing agents to talk 'reconstruction'?

A SHOP in Oakland worked a full day last week because there wasn't any 'drive' slated. The speaker didn't show up.

SOME of us understood that scrap was going to be short but it isn't. It's eight feet long and has to be put under the drop.

BILL LAUTEN had to move his pig-iron pile away from the fence because a new ham-factory has just started next door to him at South City.

AN up-country paper writes up a local foundry and speaks of "a ponderous cauldron holding thirty-two thousand ounces of red-hot iron."

A NORTH BEACH foundry has so much nautical labor that the foreman hollers: "Avast there, my hearties,

clear away the cupola scuppers, port the crane and 'heave ho' on the ladle."

Now that the labor movement is planning an international organization, we may expect its name to be 'The Amalgamated International Consolidated and Federated Brotherhood of Unionized Journeymen of Labor'.

A WILD yarn comes from Milwaukee that Charley and Clarence figured that the 'flu' might get bad, so they abandoned the convention and consumed an unknown number of Bermudas as an antidote. This can hardly be credited in a town where antidote palaces flourish on every corner, but the two 'C's' were taking no chances, and when you 'eat 'em raw' no masks are needed. We tried to pump Bill Mulcahy about this, but he just looks serious and talks carefully, though he does say California had a strong representation.

THE California Metal Trades Association has moved into the new flat in the Rialto building, where the kitchen arrangements are better. Secretary Metcalf says the furnishings will be representative and distinctive, with boiler-plate tables and engine-turned chairs. A modern office-tractor will convey papers back and forth, and the buzzer system is so arranged that everybody can answer at once, thus avoiding any delay in getting the right party. When the boiler-makers meet, an air-gun gets busy on a steel plate and creates a homelike atmosphere.

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Foundrymen's Club

Cores will be the Subject at the Next Meeting

Everyone was sorry that it was necessary to postpone the November meeting. A fine program was in the process of preparation when the edict of the Board of Health placed meetings under the ban.

But the Committee has had time during the enforced vacation to enlarge on the plans that had been made. So on the evening of December 5 at 8 p.m. the best program of the year will be given.

Bill Lauten, chairman of the core committee, and his colleagues have secured a valuable fund of core information for your consideration. They will lead a discussion on:

'Mixtures for Large Marine-Engine Cylinder-Cores'
and
'Miscellaneous Cores That Can Be Made from the Same Mixtures'.

You are invited to discuss their data and your own ideas during the period allotted to the discussion. Let us make this discussion one of the vital parts of the Club programs.

Other features of the program are:

Brief and snappy impressions of the American Foundrymen's Convention by some of the California delegates.

Music by the Orchestra under the leadership of Billie Koch. A smaller orchestra but the same high-class music.

A brief explanation of the piece of iron that was passed from hand to hand at the October meeting. Jack Cope will tell you what he has found out about this freak.

The community sing will be led by Frank Kramer. He wants you all to sing.

THE SONG OF THE CHIPPER

A special Christmas Stunt will delight you as the closing number of the program.

A new refreshment committee will be on hand to tempt and delight your appetites.

We will meet you there.

Our New Home

Yosemite Hall in the Native Sons building on Mason street between Geary and Post has been leased for the meetings of the Club for the year beginning with December. The only night we were able to secure this fine hall was on the third Thursday evening of each month, so we were forced to make a change from the second to the third Thursday evenings of each month. We ask that, beginning with January, you reserve the third Thursday evening rather than the second for the Club meeting.

Boosts

You may wonder what the Foundrymen's Club is for, and what it has done, so let us listen a minute while the horn is tooted. The history of the Club is interesting reading. It tells of the small beginning away back yonder in pre-historic times, it tells of the many obstacles and the many mistakes of the Dark Ages, it tells of a new impetus during the Reformation, and in the latest chapter, it tells of the Club blossoming into a strong and valuable asset to those who have availed themselves of its privileges.

The privileges of the Club, while they have included good fellowship, sociability, and splendid music, have been essentially educational. When we speak of the Club as an educational institution we do not mean the intellectual and scholarly training of the university but rather the common-sense plain and open discussion of foundry practice. It is true that we have had polished and intellectual addresses before the meetings of the Club, and these have had their part in our growth. However, some of the most lasting things of the Club have

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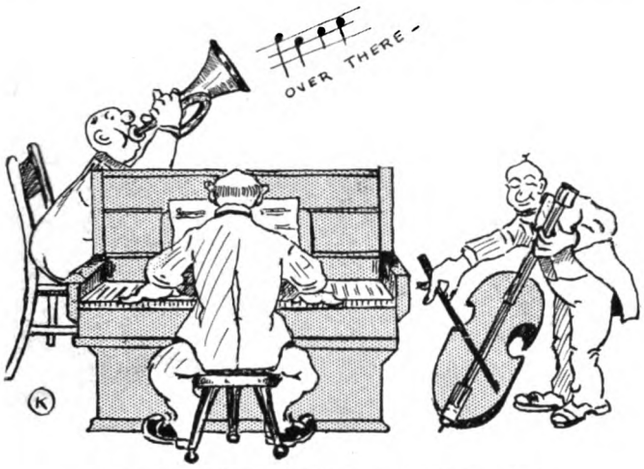

A Smaller Orchestra but the Same High-Class Music

been the man-to-man discussions in which we have all engaged.

During the recent strenuous and anxious period through which we have just passed the value of the Club was strongly brought home to one foreman. In his shop the melter died from the effects of the 'flu'. One of the cupola helpers was sick in bed and the other helper was scared stiff. This left the foreman master of the cupola, for assuredly it was up to him. He had no other melter in his shop but he faced the emergency bravely. He was well versed in cupola practice, for he had always been an ardent Club member, so during the emergency he ran his own cupola according to the lectures he had heard in the Club meetings.

You remember the man that some time ago advocated the use of heap-sand, sawdust, and Spring Valley water as the best mixture for core-making. You remember how he was jumped on because he advocated such simple cores. In one shop the owner tried to put the simple method in action on the core-bench but without avail. But this advocate of the simple mixture was persuaded to give his talk again about a year later. This time the foreman of the core-bench was present and heard the formula. The next morning he accosted the owner and said, "There is no core-maker that can make better cores than I can. If that man can make cores with heap-sand, sawdust, and water, I can too." The result is that the sand-man and the compound-man and the core-oil man get a cool reception in that shop, while the bills for sawdust and water are cheerfully paid out of the savings.

See Him at the Next Meeting

It is assumed that every foundry gets free coke, so the following will not interest you at all. A few months ago some misguided melter, during a cupola discussion, gave vent to his ideas about column-charging. He was laughed to scorn by some, his ideas were thrown aside as trash by others, but there was one man that listened and jotted down all the points of the talk. He went back to his own battery of cupolas and, after a wordy battle with the melter, persuaded him to try the new method. The melter was secretly gleeful for he knew that the iron would not melt and if it did it would be so dull that it would never pour the molds. But the smile of scorn gave way to a smile of content when he found that the iron was just right and that he had been saved the trouble of shoveling about 900 lb. of coke. This foundry is now using column-charging almost exclusively and is saving about 40% on coke. But then, as you get coke free, this is no saving.

This is not a fairly tale. Everything mentioned in this 'boost' is a fact and we can prove it. Do you think the Club a success? These fellows do.

Meetings

The regular open meeting of the Club is held on the third Thursday evening of each month at 8 p.m. in Yosemite hall, Native Sons Bdg., 430 Mason street, near Geary. All foundrymen are invited.

The Policy Committee holds its regular monthly meeting on the fourth Thursday evening of each month in the Association Assembly hall in the Underwood Bdg. All suggestions for consideration must be sent to the manager before that time.

Ray Center of the Bethlehem Shipbuilding Corporation went on a hunting trip to the rice-fields to give the ducks a warm reception. The birds all awaited Center's arrival with interest in order to get a line on the kind of equipment carried by the famous hunter from the plant of battleships and submarines. One venturesome 'spooney' ventured too close to Center's trusty flock of destroyers and promptly fell a victim. Now here is where Center found to his sorrow that he was not quite as fully equipped as he was led to believe, for when he started after his game, he found a deep hole in the pond, and as he went down and the waters closed over his head, he thought of all those subs and destroyers at home and wished that he had one handy in his hunting-kit. In the meantime, Mrs. Kelley, the famous cook who makes delicious dishes to tickle the palates of the foremen of the Bethlehem plant, was keeping up a warm fire awaiting the coming of Center's ducks, The Ducks That Never Came.

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Formula for Sandless Core

The newly patented sandless core is made from the same material that the baker uses for the hole in the doughnut. The process of manufacture is as follows:

Use a piece of ⅛-in. gas-pipe 30 in. long.

Slip the end of the pipe into patented paste (Stickem-petro).

Blow in the other end of the pipe while holding the pasted end in the core-box.

No ramming or venting necessary.

Cores last indefinitely.

N. B. "Stickem-petro" for sale by Casey Snow Ditty & Co.

"Maybe"

In the November issue of 'Metal Trades' the question was asked "Can a foundry be run without cussing?" Maybe. It all depends.

It would seem oftentimes that it is absolutely impossible to produce good castings without the proper mixture of sulphuric expletives. After the average foreman has spent a hard day herding the sand-rats into their proper diggings it is small wonder that he loses his temper at blast-time, for the following schedule is the rule:

The iron comes down dull.

The tap-out man makes a false move with the bott-stick and a half ladle of iron runs out on the floor.

Some molder forgets to wedge an important clamp and a perfectly good casting takes the shape of scrap in the gangway.

Some core-maker has been careless in venting a core and the gas spoils a day's work.

Some laborer chooses this opportune time to drop a pig of iron on his foot necessitating a joy-ride to the emergency hospital.

With all of this coming at the end of a Perfect Day is it any wonder that the air in some shops is blue, not only with core-smoke but also with explosive expressions?

On the other hand there are shops where the work is performed and the iron is poured in comparative silence and surely without the valuable assistance of so much of the 'verbal renegade' stuff. But you say that in such shops the afore-mentioned conditions do not exist. Hold on a minute, a foundry is a foundry and the conditions that have been mentioned apply to all shops alike. They are common troubles seen without a spy-glass.

Running a foundry without cussing does not depend on the foundry but on the temperament of the man that is doing the running. If he is nervous and excitable it is probable that at blast-time his nerves will transfer themselves to his language, but if he is well-balanced he can run the foundry without cussing, no matter what conditions exist, for cussing is a sign of inward rather than outward disturbance.

ONE WHO KNOWS.

Positions Wanted

Middle-aged man with wife and six strong well-preserved sons, wants position or job as caretaker or butler at gentleman's estate. Can read, write, and speak several languages, and is very fond of little children, gentle and kind to old people. Resigned former position by mutual consent, and is therefore without letters of recommendation or character. Ample wardrobe will be available for tableaux or private theatricals. No triflers. Address W. HOHENZOLLERN,
Temporary address, Holland.

Chauffeur or groom wants position in private family; very careful driver, guaranteed never to run into any danger. Willing to work for board and lodging and a quiet home in the country. Prefers the society of horses and other dumb animals. Has a discriminating taste in wines and liquors, and will not consider location in a dry State. Please wire prepaid, as the time is short. Address
FRED. WILL. HOHENZOLLERN,
Holland.

More or less able seaman wants job running gasoline motor-boat. Was in last job several years, but employer lost all his money and is now a fugitive from justice. Applicant was formerly in charge of several motor-boats and other vessels, but change of ownership on November 11 necessitated resignation. Will accept pay in Liberty Bonds, War Savings Stamps, or any other security convertible into food. Speaks German, and has recently acquired an understanding of English and American. Please rush, as climate at present location is undermining health. Address TIRPITZ,
Care Soldiers' and Workmen's Council,
Kiel.

Corresponding secretaries, experienced explainers, camouflage artists, and competent all-around fight promoters want positions. Can guarantee to explain anything, providing suitable audience is furnished. Recent changes in local conditions have seriously affected market for our services, and indications are that a change of location would be advisable without delay. Address
HOLLWEG,
HERTLING,
BERNSTORFF,
ZIMMERMANN,
Berlin.

Competent and experienced butcher will consider offer from beef-packing concern. Four years intensive study of modern methods and their practical application in several localities assure maximum results, wholesale and retail. Having finished last job, am about to be laid off indefinitely. Last employer sold out and moved to another locality, so desire to move before his successor begins investigation. Can furnish assistant, Mr. Ludendorff. HINDENBURG,
Berlin.

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Notable Recent Technical Articles in Abstract

Report of the Committee on Standardization of Flanges and Pipe Fittings. Journal of the American Society of Mechanical Engineers, October.

Gives complete standards of 50-lb. fittings from 12 in. to 100 in. diam., and 800-lb., 1200-lb., and 3000-lb. fittings from ½ in. to 12 in. diameter.

Cleaning Foundry Air Electrically. By H. D. Egbert. 'The Iron Trade Review', October 24.

Describes the application of the Cottrell electric precipitation process, to the elimination of dust from sand-blasting and tumbling-barrel operations in foundries. A high-tension direct current is used, but the power consumption is relatively small, from 7 to 10 kw. for cleaning 10,000 cu. ft. of gas or air per minute.

Hardness of Soft Iron and Copper Compared. By F. C. Kelley. 'General Electric Review', October.

Describes a series of experiments conducted with American ingot iron containing over 99.9% pure iron. Sheet-bars 5/32 in. thick were annealed under various conditions in the electric furnace. Iron annealed in hydrogen at 900 to 950° C. for three hours and similar iron annealed in a vacuum at 1000° C. for two hours were both found to be considerably softer than ordinary commercial copper and not much harder than the same copper after annealing. This indicates that carefully annealed iron can be employed for many purposes where copper is now used because softness is required.

Training School for Machine Operators. 'The Iron Age', October 24.

This school has been established by the Timken Roller Bearing Co., of Canton, Ohio. 'Green' employees are placed in this school instead of being trained in the shop itself. The school is in a separate building. Instruction is given in the use of automatic screw-machines and grinding-machines, the greater part of the company's work being done on these machines. Men in the school are paid the same hourly rate and premium as in the regular shop. The length of time for instruction varies with the invidual, but is usually three or four weeks for the grinding-machines and three months for the screw-machines.

Electric Pig Iron from Steel Scrap. By Robert Turnbull. 'The Iron Age', October 24.

Describes methods at several Canadian electric furnaces. On account of the War, Canada has found it impossible to import low-phosphorous blast-furnace pig-iron from the United States, and practically all her requirements in this line are being produced in electric furnaces. Electrode consumption has been reduced to 21 lb. per ton and current consumption to 500 kw-hr. per ton. Carbon content is kept between 3 and 3.5%. Turnings are the main source of scrap at the present time, a mixture of 50% turnings and 50% iron ore giving good results. The electric furnace should be able after the War to compete with the cupola in melting iron for foundry purposes.

Casting Under Pressure. 'The Iron Age', November 7.

Describes a process for casting certain non-ferrous alloys developed by the Morris Engineering Co., of New York. The molten material is poured into metal molds and formed under pressure. Such castings possess greater tensile strength, increased density, and freedom from blow-holes. Alloys of copper, zinc, and lead; aluminum and zinc; and aluminum, copper, and iron are some of those cast in this way. It seems probable that pistons and other important parts of aeroplane motors can be made by this method better than by the ordinary methods.

Some Notes on Office Equipment and Methods. By C. M. Ripley. 'General Electric Review', October.

The author makes a strong plea for the elimination of a large number of files and other records, which cost hundreds of dollars to maintain, but which are consulted about once a month, and then only on relatively unimportant matters. Many labor-saving devices are described, some of them applicable to large concerns only, but most of them suitable also for small offices. Some of these are: A bank of lamps at the telephone-girl's elbow, one for each man in the office, which indicates directly if a man is in or out. Ceilings covered with acoustic felt to reduce noise. Separate circuits to especially busy telephones, to permit a man called to obtain information over another telephone while keeping his questioner on the first line. Special compartments for mail to large customers, so that when several letters from different departments go to them in one day, the mail can be combined at a saving of envelopes and postage.

Iron Ore Supplies of Alsace-Lorraine. By Sidney Paige. 'The Iron Age', November 7.

In 1913 Germany produced 28,600,000 tons of iron ore, of which 21,000,000 tons came from Lorraine. In the same year France produced 21,700,000 tons, of which 19,500,000 tons came from the Longwy-Briey region, which was controlled by Germany during the War. On the other hand, France produced 40,000,000 tons of coal in 1913, and imported 20,000,000 tons of coal and 3,000,000 tons of coke. Lorraine produces 4,000,000 tons of coal per year, but consumes 6,000,000 tons of coal and 4,500,000 tons of coke. Therefore, when Lorraine is returned to France, while she will have her production of iron increased greatly, the deficit and the need for importing coal will continue. The annexation of the Saar valley to France has been proposed. This valley produces 13,000,000 tons of coal and coke per year, but even this would not obviate the necessity of importing fuel. Most of this fuel came from Germany before the War.

Conservation of Tin in Bronze Bearing Metals. By G. H. Clamer. 'The Foundry', November.

The old practice in making bearing alloys was based on the theory that a bearing must be hard in order to resist wear. Consequently a straight copper-tin mixture was preferred. Such alloys because of their inability to adjust the surfaces to slight irregularities, will actually cut, heat, and wear worse than the softer alloys. Experiments made several years ago by C. B. Dudley for the Pennsylvania railroad showed good results for alloys containing approximately 80% copper, 10% tin, and 10% lead. At that time, difficulty was experienced in casting mixtures containing more lead than an alloy of 77% copper, 8% tin, and 15% lead. Recently, however, alloys containing 65% copper, 5% tin, and 30% lead have been cast, but this is too soft for most bearings. Better results are obtained with an alloy composed of 73% copper, 7% tin, and 20% lead, while for some heavy locomotive service an 80-10-10 alloy is more satisfactory. The addition of phosphorus increases the compressive strength of an alloy, and therefore permits reducing the proportion of tin. Antimony in small quantities can be substituted for tin. It increases hardness but reduces ductility. Alloys containing 65% copper, 30% lead, 2% tin, and 3% antimony have been used. Nickel can also be used to replace tin to a certain extent. Zinc and aluminum are useless as substitutes for tin. While copper-tin-lead alloys are preferred now for bearings, this does not necessarily prove that some other combination may ultimately be discovered that will be better.

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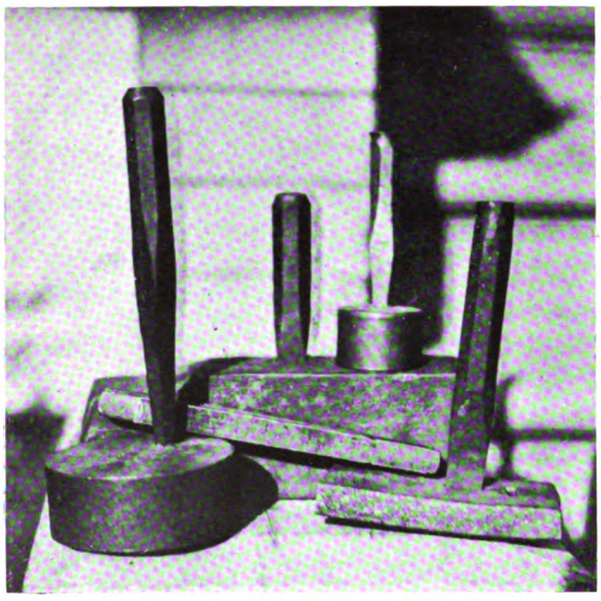
INDUSTRIAL EQUIPMENT

NEW METHOD OF TEMPERING STEEL

A few years ago a traveling blacksmith came to a copper mine in northern California with a secret method of tempering tools. His demonstrations were so promising that he was paid to show the mine-blacksmiths how to use his method. The temper turned out to be as good as represented and is still being used with great advantage to the drilling operations.

When Frank M. Leland became efficiency engineer for the Moore Shipbuilding Plant it occurred to him that the adoption of this method would result in economy in the tool department. He thereupon got in touch with the demonstrator of the process and had it adopted by the plant-blacksmiths, who find no difficulty in producing tools that give the desired results.

By the use of this method as shown in the illustration chisels can be given such a fine temper that they can be driven with a sledge-hammer through two inches of steel without damaging the point. For some purposes ordinary



Chisels Tempered by the Wheeler Method

steel, after being tempered, will take the place of the highest grades of tool steel. The saving directly traceable to the method amounts to $1500 monthly at the Moore plant. The number of tool-dressers has been reduced by 75%. Chisels for pneumatic tools ordinarily had a limit of about two or three hours use. Now, however, it is not uncommon to have these chisels last two weeks. They stand up for several days under the hardest kind of work.

A similar saving has been made in the use of snap-heads of riveting hammers. Records show that the breakage has been reduced to 15% of what it was before the method was introduced.

In a report on the process to A. F. Pillsbury, district officer for the U. S. Shipping Board, the late G. W. Dickie, resident inspector stated: "There is no doubt about the results that have been obtained at the Moore Shipbuilding Co.'s yard. Both the men and the company are satisfied that they have been put in possession of a very valuable art in making tools that will stand the hard work of the shipyard, and thus cut down materially the time lost by the men in getting a supply of fresh tools, as those they work with fail, and the time of the tool dressers, which has already been cut down to about one-fourth of what it used to be."

Mr. Dickie gave the following description of the method but stated that without the demonstration of the inventor the instruction was of no value.

"Mr. G. Wheeler, who is spreading the knowledge of this art, claims that his method is based upon scientific laws not heretofore understood, yet always existing. For instance, in his first instruction he says, 'Forge the steel at orange heat until you get it forged out for whatever you are making. This is done to prevent having more than one grade of steel to contend with, for the different heats make the different grades of steel, therefore use the orange heat as much as possible while you are forging the steel.' Here comes in a little mystery—'Refine the steel with low red heat with hammer and water.' This he calls 'puddling'. 'The more you puddle, the finer the steel is. Good tools must be made from fine steel, therefore, refine it well. Should you see the water set on the steel while you are puddling, stop at once, as you have the wrong heat and would crystallize it at that heat. Equalize the steel by heating to a low red, and wait till the red is gone, then dip in warm oil. This is done to prevent the steel from cracking and springing while you are hardening, also to remove all hard spots. It is ready now to turn in a lathe, also to file or harden.'

" 'Heat to a low orange or bright cherry to harden, and plunge in water or oil, whichever it may be. If you harden in oil, you yet have dominion over the steel so that you can bend or curve it after you have it hardened. Now clean off the steel so you can see the colors, and draw to the standard colors of whatever you are making.' "

The process appears to conform in many respects to well-known principles of heat treatment. It is desirable to have a fine grain in order to get the best results from edged tools. Forging at a low temperature tends to produce this result as does also the slow cooling. One method of heat treatment used extensively in Sweden, and designed to produce a tough steel, consists of several, sometimes as many as five, successive heatings, each to a little higher temperature than the preceding one, and with very gradual cooling between heatings. Double quenching in oil and water is also known to steel men as producing a fine-grained tougher steel that will hold its edge far better than the temper produced by the usual single-water quenching and drawing.

Whether or not Wheeler's method is original is not important for it is obviously a process that is a great advance over the methods in general use, and one that could be adopted with advantage in many shipyards and factories.

PRODUCTION OF FERRO-ALLOYS AT HEROULT, CALIFORNIA

Several years ago the Noble Electric Steel Co. constructed a number of electric furnaces of the Heroult type at Heroult, California. Although originally intending to produce steel, the company has confined itself for some time past to the making of ferro-alloys, particularly ferro-manganese. At the present time, two 1500-kw. furnaces are in commission, both working on ferro-manganese. Both the 70% and the 80% grade ore produced, the latter for such plants as have received permission from the Ferro-Alloys Board of the Iron and Steel Institute to use the higher grade. The total output from both furnaces is about 1,000,000 lb. of alloy per month. Most of the alloy is consumed in plants on the Pacific Coast, but some is shipped to Eastern plants.

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The company also operates an iron mine at Heroult. The ore contains 62% iron and is the principal source of supply for the various open-hearth furnaces on the Coast. Lime for flux is also produced at Heroult, and both the lime and the iron ore are used by the company in its ferro-manganese production. About 100 men in all are employed in the operations at Heroult.

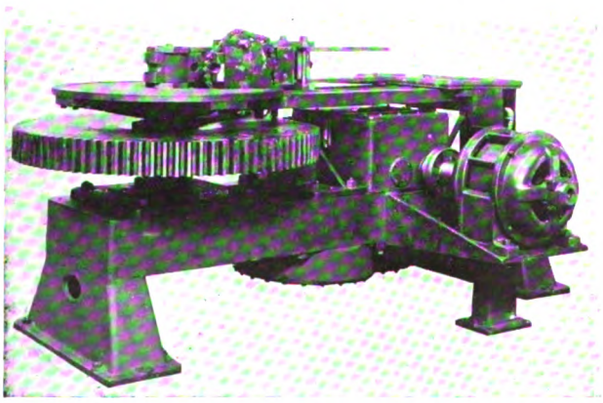
Last year the Pacific Improvement Co. announced that it expected to increase the output of coke at its Carbon Hill property in Washington, and, in consequence, the Noble company built a small blast-furnace at Heroult, with the expectation of making low-phosphorous pig-iron, but, as the necessary coke has not been obtainable, the furnace has never been put in operation. The company is also experimenting with the production of granulated metallic iron by a de-oxidizing process without the use of coke. The results have thus far been encouraging, but sufficient progress has not been made to warrant any definite statements.

The company also operates four chrome and four manganese properties in various parts of California.

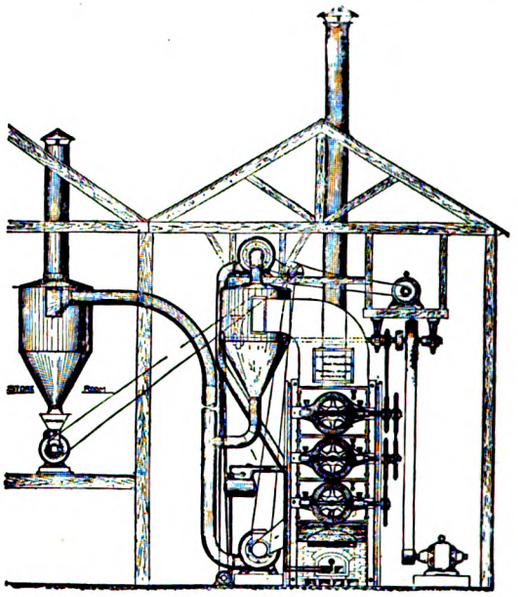
Sign at the Entrance to a Local Shop

TRADE NOTES

U. S. Shape & Pipe Bending Co. has sold an 8-in. machine to one of the local shipyards. This machine will bend all sizes up to 6-in. pipe cold. Larger sizes are bent hot.



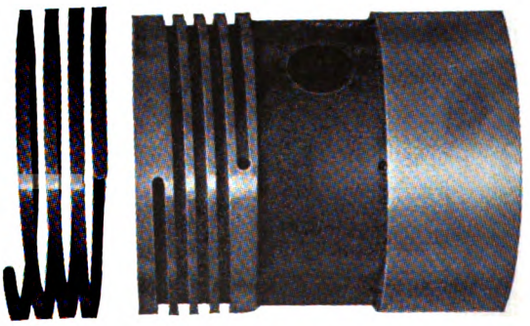
The California Press Manufacturing Co., formerly known as Toulouse & Delorieux Co., has developed a continuous process for the manufacture of fish meal and oil from trimmings and refuse from canneries. The complete plant is a unit mounted upon a single base, a small engine or motor furnishing the power. The small size plant can be operated by one man and the large size requires two, no other labor being necessary. The fish-waste entering at one end is cooked, the liquids extracted, and the residue dried, cooled, ground, and delivered into sacks at the other end. The process is continuous and automatic. The process produces a light colored meal that is a fine poultry food and a valuable fertilizer. Other products are a superior grade of oil and



Fish-Meal Plant

a glue stock. Three sizes of plants are made having capacities of ½, 1½, and 4 tons of fish scrap per hour, respectively. Fifteen of these plants are now in successful operation.

The Pacific Gear & Tool Works has developed and is now manufacturing a new style piston-ring that has many advantages over the usual type. The 'Four-in-One Helix' piston-ring is a coil of four complete circles in one continuous piece. This gives an equal distribution of expansion over the full length of the ring and takes up the wear in the



'Four-in-One' Piston-Ring

cylinder without leaving any gaps. Sharp points and weak places which may break off and score the cylinder are eliminated. The rings can be adjusted to a piston in a few seconds, being screwed on as a cap is screwed on a bottle. The rings are now in use on 900 automobiles and tractors and are giving satisfaction. Recently a large Holt tractor equipped with the 'Four-in-One' rings was operated 24 hours per day for 32 days. When it was overhauled the rings were found to be in perfect shape and there was scarcely a trace of carbon on the pistons.

Work on the various power projects in connection with the Los Angeles aqueduct will be resumed. Bids for furnishing about $100,000 worth of steel pipe and other equipment will be opened by the Department of Public Service

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on December 20. This material will be used for pipe-lines and the penstock at power-plant No. 2 in the San Francisquito canyon.

The Sperry Flour Co. will construct a grain-elevator and warehouse at Riverside.

A bond issue of $5,000,000 for harbor improvement has been voted at Portland.

The Northwest Steel Co., of Portland, is building a joiner-shop. Contract for the work was awarded to Trenchall & Parelius.

The Union Construction Co. has moved its general offices from 604 Mission street to its shipyard on the Oakland waterfront.

The citizens of Astoria, Oregon, have voted bonds for $800,000 for the improvement and extension of the municipal water system.

The Thomson Bridge Co., of San Francisco, has obtained a site at Vallejo for a plant for the construction of concrete ships, using magnesite cement.

The Riblet Tramway Co., of Spokane, has been awarded the contract for the construction of a two-mile aerial tramway for the Copper World mine.

The Thomas Day Co. is making a large number of binnacle and battle lamps for the Government. Practically the entire output of the plant is war work.

B. H. Tripp has been appointed district manager of sales for the Pacific Coast territory for the **Chicago Pneumatic Tool Co.**, succeeding M. W. Priseler.

The Westinghouse Electric & Manufacturing Co. has been awarded a contract for furnishing three 25-hp. induction-motors for the Hetch Hetchy project.

Major Norris K. Davis, president of the **N. K. Davis Machine Works,** has been in the Ammunition Transport Service in France for the past ten months.

The Hanlon Drydock & Shipbuilding Co. has just completed the erection of a 100 by 360 ft. machine-shop. A number of large machine tools have already been installed and the tools from the present shop will be moved to the new shop in the near future. A storeroom 50 by 100 ft. and a mill 50 by 125 ft. have just been completed and are now in use. Two additional marine ways are being built to the east of the present ways on which vessels up to 10,000 tons capacity can be built.

J. L. McLaughlin, 244 Kearny street, has been awarded the contract for the construction of an oxy-acetylene generating plant at the Mare Island Navy Yard.

F. W. Schultz and W. C. Royston, formerly with the Weidenthal-Gosliner Electrical Works, have opened the **Star-Delta Electrical Works** at 602 Mission street.

The California Steam & Plumbing Supply Co. has been awarded a contract for furnishing a quantity of standard wrought-iron pipe for the Hetch Hetchy project.

The New Ellen Potash & Chemical Co., of Los Angeles, will construct a three-story reinforced concrete building for a castor-oil mill. Frank L. Stiff is the architect.

The Moore Shipbuilding Co. has started the preliminary work for a drydock on the Oakland estuary. The dock will be large enough for vessels of 20,000 tons displacement.

The Chicago Bridge & Iron Works, Call Bdg., has been awarded the contract for the construction of a steel tower for a 100,000-gal. water-tank for the American Can Co. at Fruitvale.

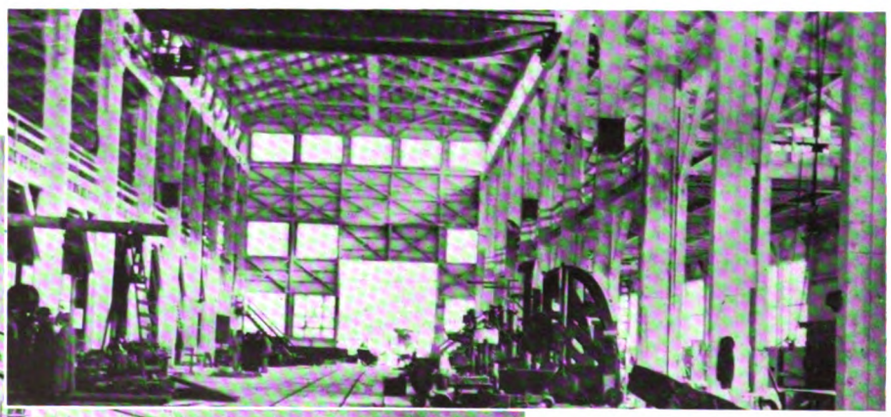
The Capital Issues Committee has granted permission to the Port of Seattle Commission to sell $1,990,000 worth of bonds for the improvement of the Smith Cove harbor and terminal.

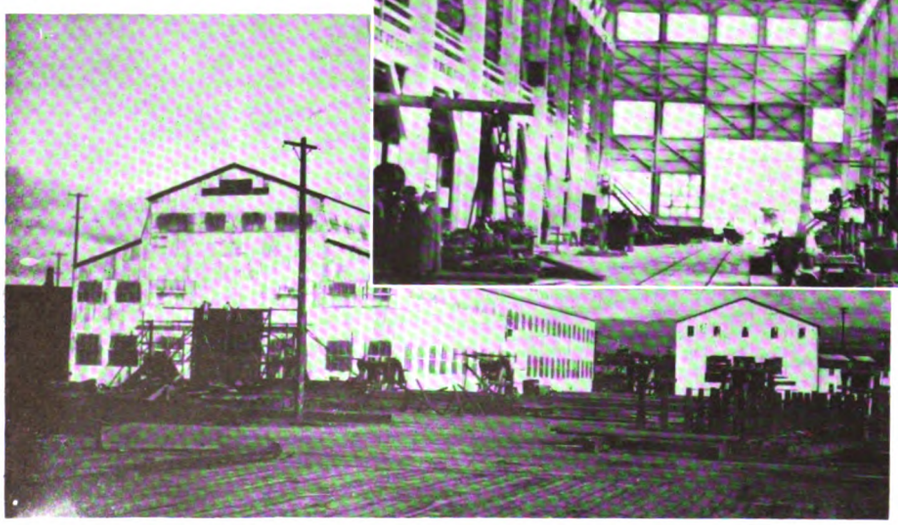
The Ross Construction Co., of Sacramento, has been awarded the contract for the construction of a marine railway at the naval coaling-station at La Playa. The total cost will be about $150,000.

The National Carbon Co. has awarded a contract for the construction of two reinforced concrete buildings at its plant at 8th and Harrison streets to J. D. Hannah. The estimated cost is $40,000.

Preliminary steps have been taken for the formation of an irrigation district containing 15,000 acres of land near Colusa, California. Water will be pumped from the Sacramento river. F. H. Tibbetts, San Francisco, is engineer.

The Ocean Shore Iron Works has been doing a large business in salvaging old boilers and has through this conservation measures been able to furnish boilers to a number of industries that would not otherwise have been able to operate.





Interior and Exterior Views of New Machine-Shop at the Hanlon Yard

The Skandia Pacific Oil Engine Co. has the first of eight 500-hp. Diesel engines that it is building, on the testing-block. These are six-cylinder engines, the cylinders being 16½ by 19 in. Four of the engines go to Singapore and the other four to Seattle.

Kingwell Bros. have moved

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their machine shop and office to a new addition, which faces on Minna street. The brass foundry now occupies the whole of the original building. The office address is now 455 Minna street, San Francisco, instead of 450 Natoma street as formerly.

The Waterford, California, irrigation district has applied to the State Water Commission for permission to divert water from the Tuolumne river below the Lagrange dam. A pumping plant will be installed at the point of diversion. The total estimated cost of the work is $50,000.

The Hall-Scott Motor Co. is erecting a 175 by 175 ft. addition to its machine shop. This will permit doubling the capacity of that department. The large volume of work on hand, which includes 150 L-6 airplane motors for one of the allied governments, has made the addition necessary.

The Norris K. Davis Machine Works has developed a new drive for its line of concrete road pavers which is a great improvement over the drive used heretofore. This company reports signs of activity in the cement contracting business which has been stagnant for some time owing to the ban on road and building work.

W. F. Stone, one of the first men to build wooden ships on the Pacific Coast, has orders from the Emergency Fleet Corporation for seven 150-ft. tug-boats. Some improvements are being made in the yard so that four tugs may be built at once. The engines and boilers will be built and installed by the Main Iron Works.

The Moore Shipbuilding Co. is using a Sullivan drill-sharpener for making bolts, upsetting boiler tubes, and even for forging small tools. The uses the sharpener can be put to with the proper dies, are innumerable. According to Frank M. Leland, efficiency engineer for the company, the saving accomplished by using the machine on one ship amounted to $732.

The Pacific Coast Steel Co. is producing sixty tons of basic pig-iron per day at its blast-furnace plant at Irondale, Washington. The iron is smelted from a mixture of bog hematite from the company's own beds and magnetic iron ore from Texada Island. The coke used is mainly from gas-plants in the North-West. Some of the iron has been shipped to the San Francisco plant.

The Pacific Coast Shipbuilding Co. launched its first ship November 30. This is the first of ten 9400-ton cargo steamers that the company is to build for the Shipping Board. The vessel was given the name 'Diablo' in honor of the neighboring mountain. Mrs. R. N. Burgess, wife of the president of the company, was the sponsor. This was the first steel launching in Contra Costa county. Henry A. Melvin, justice of the State Supreme Court and R. H. Latimer, superior judge of Contra Costa county, were the chief speakers.

George F. Drake, vice-president and general manager for the **Drake Lock-Nut Co.,** 342 Mills Bdg., has recently returned from an Eastern trip. As an instance of the way in which Eastern manufacturers are waking up to the importance of the Pacific Coast metal industries, it is interesting to note that one of the largest nut and bolt manufacturers in the United States has commenced the manufacture and sale of Drake lock-nuts at Cleveland, for Eastern delivery. Mr. Drake will devote considerable time to the Cleveland plant, but will continue to make his headquarters in San Francisco.

The Chicago Pneumatic Tool Co. has taken over all agency contracts for the Pacific Coast territory and has opened a new store and general office at 175 First street with B. H. Tripp, district manager of sales, in charge. A complete stock of machines, tools, and repair parts will be kept and a department for repair work and testing with competent mechanics from the factory will be established. Branches will be maintained at Los Angeles, Phoenix, and Portland. Mr. Tripp comes to San Francisco from the Philadelphia office of the company. He has been with the company for many years and knows the complete line.

At the annual election of the California Metal Trades Association held November 22 in the Association rooms Frank B. Drake of the Johnson Gear Co. and the Hall-Scott Motor Car Co. was elected president, succeeding O. H. Fischer of the Union Gas Engine Co., who has served two years and who refused to allow his name to be placed in nomination. Mr. Drake was the retiring second vice-president. A. S. Gunn of the Bethlehem Steel Corporation was re-elected first vice-president, and David Donzel of the Pelton Water Wheel Co. was elected second vice-president.

At the annual meeting of the California Foundrymen's Association the following executive committee was elected: John Hedley, Western Foundry Co., D. Guild, Jr., Phoenix Iron Works, and William A. Kingwell, Kingwell Bros. Brass Foundry. The executive committee elected D. Guild, Jr., President of the Association. The retiring executive committee consisted of C. J. P. Hoehn, Enterprise Foundry Co., president; H. C. Macaulay, H. C. Macaulay Foundry Co., and Nathan Alper, Standard Brass Casting Co. The Association passed a resolution thanking the retiring committee for the able manner in which they had met the difficult problems of the past year.

Book Reviews

Union Labor in Peace and War. By Walter V. Woehlke. P. 141. Ill. The Sunset Publishing House, San Francisco.

This book is based on a series of articles that appeared recently in 'The Sunset Magazine.' While some space is devoted to labor unions in general, the book is primarily about unions on the Pacific Coast and particularly unions in San Francisco. The author traces the rise of unionism in San Francisco from the days of Denis Kearney to those of P. H. McCarthy. While granting that some good has come from the unions and that much more might have come, he shows that much evil has also resulted. The various objectionable features about union methods, such as boycotts, primary and secondary, limitation of output, limitation or prohibition of apprenticeship, jurisdictional disputes between unions, as well as disorder and intimidation and maltreatment of 'scabs' during strikes are discussed. Particular attention is called to the fact that many unions, like many political bodies, have suffered from the indifference of the more respectacle members to the affairs of the union, with the result of boss rule. The subservience of some public officials to the political power of these boss-ruled unions is condemned. Present conditions, and particularly conditions last winter, in Western shipyards are discussed and the charge is made that, at the time the articles were written at least, there was intentional 'slacking' in the form of limitation of output in many of these yards. A chapter is also devoted to the I. W. W. and the book closes with a discussion of incidents where 'the square deal' paid both employer and employee. While the author would hardly be considered as friendly to the labor unions, he has tried to be fair to both sides, and the book will repay study, not only by the workingman and the capitalist, but also by that innocent third party, the general public.

The Call of Humanity
is "Join the Red Cross"

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